LOAN DOCUMENT

PHOTOGRAPH THIS SHEET

DTIC ACCESSION NUMBER

LEVEL

0

INVENTORY

Bird Strike Committee Europe (BSCE), 13th Meeting - - - -

DOCUMENT IDENTIFICATION

1979

DISTRIBUTION STATEMENT A
Approved for Public Release
Distribution Unlimited

DISTRIBUTION STATEMENT

H A N D L E W I T H C A R E

ACCESSION FOR		
NTIS	GRA&I	☑
DTIC	TRAC	☐
UNANNOUNCED		☐
JUSTIFICATION		
BY		
DISTRIBUTION/		
AVAILABILITY CODES		
DISTRIBUTION	AVAILABILITY AND/OR SPECIAL	
A-1		

DISTRIBUTION STAMP

DATE ACCESSIONED

DATE RETURNED

19990910 077

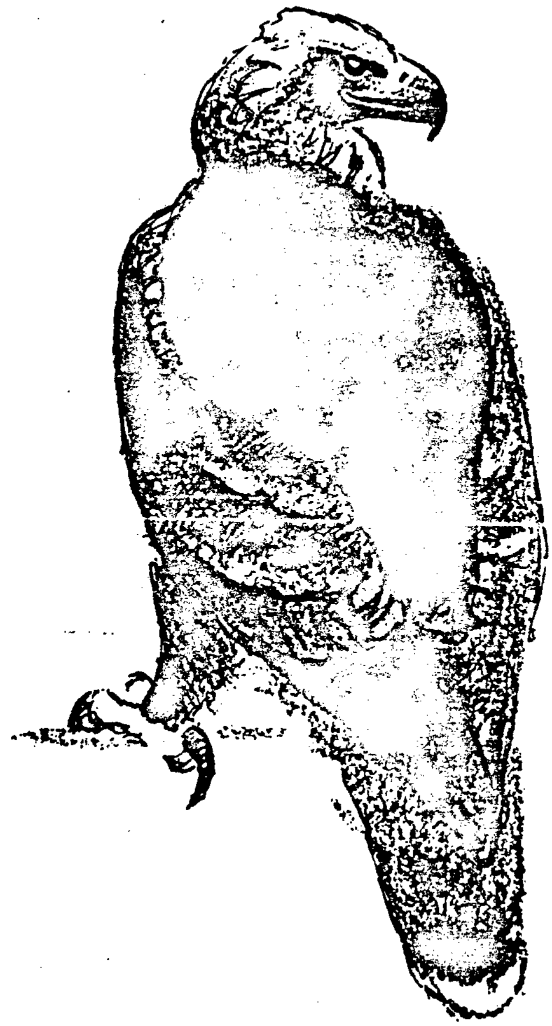
DATE RECEIVED IN DTIC

REGISTERED OR CERTIFIED NUMBER

PHOTOGRAPH THIS SHEET AND RETURN TO DTIC-FDAC

13th MEETING

BIRD STRIKE COMMITTEE EUROPE



Val Cluozu

3 juill. 1936

drawing by

Robert Hainard

BSCE-BERN-29th May to 2nd June 1978

REPORT DOCUMENTATION PAGE

Form Approved OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	1979	Conference Proceeding 29 May - 2 June 1979

4. TITLE AND SUBTITLE
Bird Strike Committee Europe (BSCE) , 13th Meeting, Bern, Switzerland
29th May to 2nd June 1978

5. FUNDING NUMBERS

6. AUTHOR(S)
Bird Strike Committee Europe

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Bird Strike Committee Europe

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Bird Strike Committee Europe

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES
Copyright waived per email from Willemijn Prast, Sent: Wednesday, September 01, 1999,
To: Short, Jeffrey, USAF IBSC Representative, Tyndall AFB, FL 32403.

12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for Public Release; Distribution Unlimited

12b. DISTRIBUTION CODE

A

13. ABSTRACT (Maximum 200 words)

The Bird Strike Committee Europe consists of civil and military participants from Europe with a common interest in the bird strike problem. Attendance is open to participants from other parts of the world. Annual Meeting Proceedings include Chairman's Report, Working Group Reports and Papers Presented:

TABLE OF CONTENTS:

14. SUBJECT TERMS
Bird Strikes, Aviation Safety, Airports, Hazards, Survivability, BSCE, International Bird Strike Committee, IBSC

15. NUMBER OF PAGES
418

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19, SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UL

13th Meeting of BIRD STRIKE COMMITTEE EUROPE

Held in Berne, Switzerland

29th May - 3rd June 1978

Federal Air Office

CH-3003 Berne

Inspection Générale de
l'Aviation Civile
246, rue Lecourbe
75732 Paris CEDEX 15
France

S U M M A R Y

The 13th Annual Meeting of Bird Strike Committee Europe was held in Bern between the 29th May and 2nd June 1978. The Committee is a joint Civil-Military committee and has been led during the period 1974 - 1978 by Mr. V.E. Ferry of France as chairman. At the 13th Meeting Mr. L.O. Turesson of Sweden was elected new chairman.

This year's meeting in Bern was organized by the Federal Air Office of Switzerland and was attended by members from Austria, Belgium, Canada, Denmark, Finland, France, Federal Republic of Germany, The Netherlands, Norway, Switzerland, Sweden, United Kingdom, USA as well as observers from IATA, IFATCA, IFALPA, AACC, WEAA.

The meeting commenced with three days of specialist Working Group meetings followed by a two days Plenary Meeting.

The Committee's work includes the use of radar to track bird migrations and movements in order that warning to pilots can be issued, research and trial of measures to discourage or move birds from aerodromes, collection and analysis of bird strike data, compilation of maps of European bird movements, collection of informations on structural testing of civil air-frames, and the establishment of communications systems for pilot warnings.

A great number of Papers were presented at the meeting.

BSCE 13

30 July 1978

Table of contents

SECTION 1 - Recommendations

4

THE BIRD STRIKE COMMITTEE EUROPE RECOMMENDATIONS

A. Based on the work of Bird Movement working group

1. Countries are requested to rewise continously the existing combined bird strike risk maps (scale 1:2000000) and the AIP-maps regarding special criteria.

2. Countries should use wings as special symbols for bird concentration areas in the ICAO aeronautical maps (similar to that shown at the Danish maps).

B. Based on the work of Analysis working group

1. Each airline should be encouraged to make bird strike reporting forms available in the cockpit of every aircraft.

2. In accordance with ICAO State letter AN3/32-76/111 "Foreign" bird strikes should be made known to the country in which they occur. In the Far East Asia/Pacific Region these should be sent via the ICAO Regional Office in Bangkok, who have agreed to act as coordinators.

C. Based on the work of Radar working group

1. The committee confirms recommendation C1/BSCE 12 and emphasizes the need to improve the active collaboration in bird migration research in Europe. The Committee also recommends that in addition to the radar chain along the Alps, a second chain should be established throughout the North Sea area, if technically possible.

D. Based on the work of Structural testing of Airframes working group

1. That, to facilitate a more positive and orderly response by BSCE participating countries to the tasks of the Working Group, a member should be appointed by the national committee for bird strikes of each participating country to be responsible for reporting to the BSCE progress in support of the recommended tasks of the Working Group.

2. That the attention of pilots and operators should be continued to be drawn to the deterioration in bird impact resistance of windscreens which rely on the maintenance of an optimum temperature for strength if,

   - insufficient time is given for warming up the windscreen before take-off, or
   - the temperature is too high because the aircraft has been parked in the sun.

E. Based on the work of Aerodrome working group

1. There is a need for properly conducted scientific experiments, which can decide if chemical agents repel birds on airports.

2. A brochure with the aim to contain all procedures to reduce bird hazards at aerodromes is in preparation by the group. The document shall be made available to all interested parties and sent to all different international organisations concerned.

F. Based on the work of Communications and Flight Procedures working group

1. That, in support of recommendation made during 12th meeting the group should be reactivated.

2. That an experimental use of ATIS for transmission of bird movements information be started in countries and a summary of the experience gained in so doing be prepared by the group.

RECOMMENDATIONS ASSIGNED BY THE COMMITTEE TO THE WORKING GROUP

A. Working group "Analysis"

1. Previous recommendations 1.1 on Cost and 1.4 on Serious Incidents of BSCE 12 are again tabled.

2. Analysis WG Recommendation 2b from the 11th meeting in London, dealt with proper identification of bird remains. In order to find out if this has been done the WG Chairman should make an enquiry from BSCE Members.

3. See section C recommendation 4.

B. Working group "Bird Movement"

1. Review the existing combined bird strike maps provided by the different countries according to the following list of criteria:

   a) Scale 1:2000000

   b) Indications of high risk areas (black) and medium risk areas (hatched)

   c) No additional information about risk periods, migration routes, risk heights

   d) The legend should remark that black/hatched areas are areas with a risk all over the year and in flight levels up to 2000 ft (GND)

   e) More detailed information should be taken out of the AIP and/or special national maps

C. Working group "Structural Testing of Airframe"

1. That, in support of (i) and (iv) of the terms of reference, members should supply to the Chairman of the Working Group,

   a) results of any bird impact structural testing together with geometric details which have been completed by their organizations,

   b) details of any future testing programmes by their organizations.

2. That, in support of (ii) and (iii) of the terms of reference, members should supply the Working Group Chairman with details of any methods of analysing the bird impact resistance of structures correlated as far as possible with testing experience which have been done by their organizations.

3. That the Analysis Working Group be reminded of the need for adequate information on the spatial distribution of birds within a flock for the large bird sizes to enable a check to be made on the assumption that multiple bird strikes can be considered to be covered by the present single bird strike structural requirements.

4. The Analysis and Structural Testing Working Groups recognise the need for adequate information on the spatial distribution of birds within and between flocks to enable a check to be made on the assumption that multiple bird strikes can be considered to be covered by the present single bird strike structural requirements.

D. Working group "Communications and Flight Procedures"

1. That with due consideration of the task involved in selecting avoidance procedures, the group should rely on the expertise of duly appointed representatives if IFALPA, IFATCA and WEAA.

2. That the future activities of the group should be aimed, as a prime objective, to the preparation of a booklet recording the national practices and offering a suggested standardized format.

3. That an investigation of possible avoidance flight procedures be conducted by the group and the results of data obtained from countries or organizations should be stated on a working paper for discussion during the next meeting.

E. Working group "Aerodromes"

1. There is, as yet, no scientific evidence that the application of chemical agents work as bird repellents on airports.

2. The Group will prepare a brochure in which all procedures to reduce bird hazards on aerodromes will be listed and explained.

RECOMMENDATIONS ASSIGNED BY THE COMMITTE TO THE LIAISON OFFICER

A. Based on the work of Analysis working group

1. That the ICAO definition of a bird strike is not complete, and should be amended to include "2.5(c) observation of a collision between a bird and an aircraft by pilots, ATC, aerodrome personnel etc".

B. Based on the work of Aerodrome working group

1. Contact the European Civil Aviation Conference (ECAC) and ask for the assistance of this organization in collecting information about bird strike preventive measures applied to European airports.

C. Based on the work of Structural Testing working group

1. That national bird strike committees be made aware of the recommendation D-1 BSCE 13.

SECTION 2 - List of Participants

//

LIST OF PARTICIPANTS

Name	Organization - Address
Austria	
Dr. Walter Wistermayer	Department of Civil Aviation Elisabethstr. 9 A - 1010 Vienne
Belgium	
J F Boomanns	Meteo Wing Luchtmacht Lange Eikstraat 86 B - 1970 Wezembeek
Leon Delanghe	Inspecteur- Regie des Voies Aêriennes Direction Exploitation Avenue des Arts 41 B - 1000 Bruxelles
Theofil Jacobs	Master Controller Belgian Air Force Molenstraat 7 B - 9740 Gavere
Canada	
R B Rathbone	1 Canadian Air Group HQ CFPO 5000 D - 7630 Lahr
William A Fowler	CFB Lahr D - 7630 Lahr
Denmark	
J F Autzen	Tactical Air Commando Denmark Koelvraa DK- 7470 Karup J
Hans Dahl	Luftfartsdirektoratet Codanhus, Gl. Kongevej 60 DK - 1850 København V.
Kurt Pedersen (WEAA)	Copenhagen Airports Authority Copenhagen Airport DK - 2770 Kastrup

AM Glennung	Copenhagen Airports Authority DK - 2770 Kastrup
Bent Junker-Hansen	Game Biology Station Kalö DK - 8410 Rönde
Dr Hans Lind	Zoological Laboratory Universitetsparken 15 DK - 2100 Copenhagen

FAA

Roger Y Pierre	American Embassy 2, Avenue Gabriel F - 75382 Paris Cédex 08

Federal Republic of Germany

Dr J Becker	German Military Geophysical Office Mont Royal D - 5580 Traben-Trarbach
Major Dieter Brüssow	Directorate Flying Safety Federal Armed Forces Germany Postfach 902500 / 501 / 07 D - 5000 Köln 90
Ing Hans J Eberhardt	Hochschule für Technik Bremen Langemarckstr. 116 D - 2800 Bremen 1
Dr Jochen Hild	German Air Force Mont Royal D - 5580 Traben-Trarbach
Dr Werner Keil	Deutscher Ausschuss zur Verhütung von Vogelschäden im Luftverkehr Steinauer Strasse 44 D - 6000 Frankfurt/Main 61
Heinz Kuckuck	Messerschmitt-Bölkow-Blohm GMBH Unternehmensbereich Hamburg Flugzeugbau Postfach 950109 D - 2103 Hamburg 95
Walter J Schabram	DELVAG Luftfahrtversicherungs AG Von-Gablenz-Strasse 2/6 D - 5000 Köln 21

Finland

Olli Uusitalo	National Board of Aviation Airports Department, Box 50 SF - 01531 Helsinki-Vantaa-Lento

France

Jean-Claude Albert	Direction Générale de l'Aviation Civile SFACT/TU 93 Bld du Montparnasse F - 75270 Paris Cédex 06
A Attig	Inspection Générale de l'Aviation Civile 246 rue Lecourbe F - 75732 Paris Cédex 15
Jean Besse	121 Rue F de Sourdis F - 33000 Bordeaux
Jean-Luc Briot	Service Technique de la Navigation Aérienne 246 Rue Lecourbe F - 75732 Paris Cédex 15
Elisabeth Dallo	Direction Générale de l'Aviation Civile - Service Economique et International 93, Bld du Montparnasse F - 75006 Paris
Bruno Delor	CEAT - Group Aérodynamique 23 Avenue André Guillaumet F - 31056 Toulouse Cédex
Vital E Ferry	Direction Générale de l'Aviation Civile 93 Bld du Montparnasse F - 75006 Paris
M Gautier	Ingénieur Général de l'Aviation Civile - Président du Groupe Problèmes Aviaires 246, Rue Lecourbe F - 75732 Paris Cédex 15
Georges Marcal	Compagnie Nationale Air France Département Lignes et Régions F - 94396 Orly Aérogare Cédex
Christiane Neveux	Service Technique Aéronautique 4, Avenue de la Porte d'Issy F - 75015 Paris

IFALPA

Jacques Sanche	Weidstrasse 9 CH - 8302 Kloten
Laszlo Zsindely	Hasenrain 12 CH - 8305 Dietlikon
Jean-Claude Sonnette	5, rue Lekain F - 75016 Paris

IFATCA

B O Rüthy	Radio Suisse Ltd Air Navigation Services POB CH - 3000 Berne 14

THE NETHERLANDS

C Bakker	De Pauwentuin 36 Amstelveen The Netherlands
Drs L S Buurma	Royal Netherlands Air Force Airstaff, Dep. of Flight and Ground Safety Postbox 90501 2509 LM 's-Gravenhage The Netherlands
J G van Dusseldorp	Ministry of Public Works Department of Civil Aviation Plesmanweg 1-6 The Hague The Netherlands
A I van Geuns	Schiphol Airport Authority P.O. Box 7501 1117 Z.G. Schiphol Centrum The Netherlands
Jr J Heijink	Royal Netherlands Air Force Air Staff, Dept. of Flight and Ground Safety P.O.Box 90501 2509 LM 'sGravenhage The Netherlands

A Klaver

Schiphol Airport Authority
P.O. Box 7501
1117 Z.G. Schiphol Centrum
The Netherlands

Drs A M Peeraer

Ministry of Agriculture and Fisheries
Bezuidenhoutseweg 73
The Hague
The Netherlands

Eng I Tengeler

Laboratory for Electronic Developments
of the Armed Forces
7 Haarlemmerstraatweg
Oegstgeest
The Netherlands

Norway

Jan Michaelsen

Zoological Museum
Sarsgt. 1
Oslo 5
Norway

P W Pedersen

Civil Aviation Administration
P.O.B. 8124 Dep.
Oslo 1
Norway

Johnny Karlsson

Ecology Building
Helgonavägen 5
S - 223 62 Lund

Bertil Larsson

Krigsflygskolan/Väderavd
S - 260 70 Ljungbyhed

Milton Mobärg

SAAB-SCANIA Aero Space Div.
Fack
S - 581 88 Linköping

Lars G Nordström

Skandia Insurance Company Ltd
S - 103 60 Stockholm

Bertil von Schantz

Board of Civil Aviation
Fack
S - 601 01 Norrköping

Lars-Olof Turesson

Board of Civil Aviation
Fack
S - 601 01 Norrköping

Switzerland

Heinz Bart	SWISSAIR AG CH - 8058 Flughafen Zürich
Dr Bruno Bruderer	Schweiz. Vogelwarte CH - 6204 Sempach
Max Lüthy	Abteilung der Militärflugplätze CH - 8600 Dübendorf
Theo Schwarzenbach	im Tobelacker Rumlikon CH - 8332 Russikon
Ulrich Schneiter	Federal Air Office CH - 3003 Bern
Marius Stäheli	SWISSAIR AG CH - 8058 Flughafen Zürich
Emil Tronchet	Direction de l'aëroport de Genève CH - 1215 Genève 15

United Kingdom

EP Church	Accident Investigation Branch Department of Trade Kingsgate House, 66-74 Victoria Street GB - London SWIE 69T
Peter F Richards	Civil Aviation Authority Airworthiness Divison Barbazon House GB - Redhill, Surrey
Martin Riley	Froebel Institute Grove House Roemamton Lane GB - London S.W. 15
John Thorpe	Civil Aviation Authority Barbazon House GB - Redhill, Surrey

USA

Dr Sidney A Gauthreaux Jr	Department of Zoology Clemson University Clemson, South Carolina 29631 USA
Robert E Wittman	Air Force Flight Dynamics Laboratory Wright-Patterson Air Force Base Ohio 45433 USA

Members and organizations unable to attend but requesting the report

Name	Organization - Address
Australia	
J H Young	Australian High Commission Australia House Strand GB-London WC 2 B 4LA
Belgium	
Marc Haerynck	Administration de l'aéronautique WTC Tour 1 Bd. E Jacqmain 162 Bte 60 B - 1000 Bruxelles
British Airports	British Airports Authority 2 Buckingham Gate GB - London SW 1 E 6 JL
Canada	
J Thompson	De Havilland Aircraft of Canada Downsview Ontario Canada M3K 1Y5
D L Thomas	National Defence Headquarters Ottawa, Ontario Canada K1A OK2
France	
Marc Laty	Service Tecnique de la Naviagtion Aérienne 21 Avenue J Isaac F - 13100 Aix en Provence
Greece	Hellenic Air Force Command GAS/FSD Holargos GR - Athen

Hungary

Stephen Zerkovitz	Air Traffic and Airport Adm H - 1685 Budapest 180 Pf 6

ICAO

- Organisation de l'aviation civile internationale
  P.O. Box 400, Succursale
  Place de l'aviation internationale
  1000 Sherbrooke Street West
  Montréal, Québec
  Canada
  H3A 2R2

- Organisation de l'aviation civile internationale
  3 bis, Villa Emile Bergerat
  F - 92200 Neuilly'sur Seine

Spain

Domingo Ramos Alegre	IBERIA Velaz Quez 130 E - Madrid 6

Switzerland

Emil Freimann	Amt für Luftverkehr DO CH - 8058 Zürich-Flughafen
J Fritz	Ciba Pilatus BP 92 CH - 6370 Stans
Martin Herzig	XIRO AG Postfach 30 CH - 1700 Fribourg 7

United Kingdom

G H Innes	Room 5 1125 Space House Kingsway GB - London WC 2

USA

E A Jerry Jerome	Flight Safety Foundation Suite 303 5510 Columbia Pike Arlington, Virginia USA 22204
Vicente Gallardo Jr	General Electric Co. Mail Drop A 69 Cincinnati, Ohio 45215 USA

WEAA

G A Champniss	Western European Airports Association rue Belliard B - 1040 Bruxelles

SECTION 3 - Opening Speech

Mr. Chairman - ladies and gentlemen

I have the great honour to welcome you to Switzerland and to this old city of Bern.

I address a particular welcome to those of you who are visiting our country for the first time.

I do hope that you will find sufficient time besides your professional activities in the conference rooms, to see things not only of Swiss birds, but of other striking natural beauties.

The Federal Air Office is the Swiss Aeronautical Authority, in which all governemental functions in civil aviation are concentrated - with the only exception of accident investigation.

Flight safety is of course one of the most important aspects of our activities and the subject matter of your conference, evaluation of bird hazards and bird strike prevention, is therefore of a great practical interest for us.

I am confident that some real progress will again be realized in and by this conference in the basic knowledge, in sharing this knowledge on an international basis, and in bird strike accident prevention. I wish you well in your endeavour.

Now, Mr. Chairman, I understand from the conference papers that the contribution of every speaker is limited to 10 minutes. In my opening speech of welcome I certainly shall not be the first speaker to violate this useful rule. I am glad to comply.

Have a successful meeting, and have a nice stay in Switzerland !

U Schneiter Federal Air Office	V E Ferry Chairman BSCE 13	Dr W Guldimann Director of the Federal Air Office	L O Turesson Vice Chairman BSCE 13

In front of GPO-Building

no comment

 no comment

SECTION 4 - Introduction by Chairman

Report by the Chairman 1978

Now that bells and officialdom connected with the third World Conference have dwindled down to a telephone book report, let me try to sing a different tune. The French use to say that happy people have no history, such is BSCE for the last eight months. Personally I was agreeably surprised by the large audience attending the 12th session and judging by members listening today I feel that the thirteenth meeting has not inhibited you because of its unlucky number.

It is also well known all over the world that Swiss hospitality cannot be matched and our host has managed to even top it and I hope that you have all had time to visit Bern, an intellectual center which believes in beauty and lives up to its reputation. Even birds are singing louder than cars' horns.

Back to business I would say that some of your devoted working-group chairmen were invited to travel abroad on behalf of ICAO and I can testify that they spent most of their time in the meeting rooms and had few possibilities to indulge in bird identification. I have been told that the same, but in different places, may appear soon, so the bird movement group would be in the position to prepare a WG chairmen migration map.

My last comment would be to say that we are now over the standard 4 lbs report and I have to remind you that if our activities need the cutting of so many trees, we will solve the problem as birds could no longer perch on them.

You can judge by my mood that Swiss hospitality was above everything expected and, in your behalf, let me convey all my thanks to Office Fédéral de l'Air, Direction des Services Postaux and individuals which have done more than their best to contribute to the success of this meeting.

SECTION 5 - Reports by Chairmen of the Working Groups of the BSCE

A - Bird Movement

B - Communications and Flight procedures

C - Aerodrome Bird Strike

D - Analysis

E - Radar

F - Structural Testing of Airframes

REPORTS FROM WORKING GROUPS

WORK PROGRAMMES OF WORKING GROUPS OF THE B.S.C.E.

1. W.G. BIRD MOVEMENT (Chairman : Dr. J. HILD, Vice Chairman - M. BOOMANS)

   Study of bird concentrations and movements and the drawing up of special maps for the information of pilots and air traffic services.

2. W.G. COMMUNICATIONS (Chairman : V.E. FERRY, Vice Chairman - M. SONNETTE)

   Study of all problems relating to the transmission of information on bird movements which could present a hazard to aviation and the provision of such information to air traffic services.

3. W.G. RADAR (Chairman : M. Bruderer, Vice Chairman - M.L. BURMAA)

   Dealing with matters associated with the use of radar in the surveillance, identification, and assessment of bird movements.

   The work of the group embraces :

   a) scientific work on bird migration,

   b) technical improvements for recognition assessment and recording of radar data on birds,

   c) proposals for operational use for radar data on birds.

4. W.G. AERODROMES (Chairman : M.K. PEDERSEN - Vice Chairman - M.H. DAHL)

   a) Preparation of general recommendations to reduce the bird problems on and around aerodromes.

   b) Coordination of bird control research activities between States concerned.

5. W.G. ANALYSIS (Chairman : M.J. THORPE - Vice Chairman - M.J. VAN DUSSELDORP)

   Collection, analysis and circulation of statistical information relating to bird strikes.

6. W.G. STRUCTURAL TESTING (Chairman : M.P.F. RICHARDS)

   (i) To exchange information on the results obtained from :

   a) Bird impact research testing of materials, structural specimens, windscreens etc.

   b) Tests to meet compliance with Civil Airworthiness requirements

   (ii) To discuss and evaluate the information in order to provide design guidance material for satisfactory methods of producing bird impact resistant structures, windscreen etc.

   (iii) To exchange information on analytical work.

   (iv) To establish liason on future research programs in order to avoid duplication.

ACTIVITIES OF THE WORKING GROUP

1. Title : Bird Movement

2. Terms of reference : Study of bird concentrations and movements and drawing up of special bird hazard maps for information of aircrews and aviation services.

3. Progress report :

a) On demand of Military Flight Safety, in the meantime Working Group held a special meeting in Germany (November 1977) with the participation of pilots in order to develop a simplified bird hazard map relating to the different ornithological conditions in the countries.

b) The existing maps have been revised and combined into one map (scale 1:2000000) for general information of pilots.

c) A draft of this map has been developped taking into account additional informations from Denmark, Netherlands, Belgium, France and Germany. The map shows areas with high and medium risk.
Sweden will provide corresponding informations up to summer 1978, UK member is requested to send more detailled informations.

d) The new map draft has been accepted by all countries interested.

e) All countries have to publish bird hazard maps in the AIP for more detailled informations of pilots.

4. Future program

a) revise existing maps, namely :
- bird hazard maps for general information;
- AIP maps for more detailled informations

on the basis of available knowledge and investigation results.

b) If necessary organise meetings of the Working Group like the meeting of November 1977 held in Germany.

ACTIVITIES OF THE WORKING GROUP

1. Title : Communications and flight procedures

2. Recommendations from the 12th meeting

5.2.1 - In order to obtain full efficiency with existing methods information given to pilots about birds must be improved.

1.1 - On the ground : by insuring that proper informations reach companies operations offices, where airline pilots are brieffed. Birdtams have also to appear under the aerodrome section on last issued notam panel.

1.2 - On radio communication : A.T.I.S. should be used when necessary to inform about birds risks.

5.2.2 - Pilots have a strong interest to be involved in any bird avoidance experimental procedure programme, in order to avoid any contradiction with other safety rules.

3. Progress report

1) All the tasks assigned to the group by the Committee during the 11th meeting (London - May 1976) and confirmed during the 12th are considered as a permanent basis for any further reactivation of the group.

2) The updated list of addresses for circulation of BIRDTAM is confirmed with the eventual addition of Switzerland's appropriate organization indicators.

3) Working papers No 21, 34 and 38 were analysed as well as discussion papers and their contents are reflected in the following items.

4) Circulation of bird movements information : It was found advisable to review the existing ways to forward such informations according to the validity and type of contents. It was suggested to use the present system in force in Federal Republic of Germany (Armed Forces) as a practical example. A questionnaire will be prepared by the WG Chairman and circulated within 2 months after this meeting. It is planned to assemble all different procedures in use in a booklet available for the next meeting. The final aim should be to reach the highest possible degree of standardization.

5) The group agreed to investigate the possibility to use ATIS system (as recommended in 12th meeting) to provide bird movements informations to pilots and so doing stimulate their attention and improve, whenever possible, the safety without overloading operational frequencies. Care should be taken in the phraseology used to prevent any risk of confusion (see Annexe A).

30 July 1978

6) A preliminary investigation was made on procedures already used in different countries when a potential bird hazard is identified. These procedures covering both air forces and airlines operations will be listed on a draft and circulate for comments to all members. A consolidated review will again be circulated in order to prepare a final proposition for the next meeting. IFALPA intends to participate actively in the evaluation of the data obtained from this investigation. In addition, some experiments on feasibility, either by crew or controllers, could be envisaged.

7) It was stressed that cooperation between existing organizations such as IFALPA, IFATCA, WEAA was deemed necessary as was, at a later stage, a close contact with IATA and ICAO.

Participants

V.E.	Ferry	France
J.C.	Albert	France
L.O.	Turesson	Sweden
A.	Glennung	Denmark
D.	Brüssow	Federal Republic of Germany
J.F.	Boomans	Belgium
T.J.	Jacobs	Belgium
J.C.	Sonnette	France
J.	Sanche	(IFALPA)
J.	Thorpe	U.K.

ANNEXE A

COMMUNICATIONS AND FLIGHT PROCEDURES WG

Experimental procedure proposed
to the BSCE Member countries

1 - Airports with ATIS Broadcast

1.1 - Categories of information suitable for transmission by ATIS

1.1.1 - Persistent bird informations :
Ex.: "Bird warning : birds movements reported on morning between 6 and 8, moving from south to north of the airport".

1.1.2 - Temporary but foreseable bird movements :
Ex.: "Bird warning : bird concentration observed over the airfield".

1.2 - Informations given by radiotelephony

Ex.: "Flight No 1 : bird warning : heavy bird activity near threshold of runway 23 reported by pilot".

1.3 - When bird information is provided by ATIS, controller should, on request of the pilot, be able to give latest details regarding the bird situation.

1.4 - Incoming pilots should be immediately informed on first contact with airport R/T (Tower frequency) of the latest details concerning the bird situation.

1.5 - When a potential danger exists bird dispersal procedure could be requested by pilot OR initiated by controller.

./5

1.6 - Messages broadcasted on ATIS should be given using the procedures recommended by BSCE :

a) Aircraft call-sign followed by station calling

b) Bird warning

c) Type of bird activity (Flocks or isolated birds)

d) Position of birds

e) Height band

2 - Airports without ATIS Broadcast

When necessary informations on birds should be given along with normal landing informations.

ACTIVITIES OF THE WORKING GROUP

1. Title : AERODROME

2. Recommendations from the 12th meeting (not reproduced here)

3. Progress report :

3.1 The names and addresses of the participants of the meeting are contained in attachement A to this paper.

3.2 The Chairman opened the meeting and informed about different practical details.

The Chairman of BSCE expressed the wish to thank the Vice Chairman for the substantial work done by producing the working papers 10 - 12.

3.3 The Working Group then reviewed the working papers presented to it.

3.3.1 Management on airport or in their vicinity.

WP 10a : Garbage dumps in the vicinity of Airports.
The paper was approved.

WP 10b : Homing pigeons in the vicinity of Airports.
The French delegation indicated that the text covering France was not reflecting the true situation. It was agreed that Mr. Ferry, within 14 days, will send a draft of a revised text to the Vice Chairman of the Working Group.
Mr. Lind and Mr. Thorpe informed the Meeting that the item was really covering two different issues, that of breeding pigeons and that of racing pigeons. The meeting agreed that this question should be studied again by correspondence indicating the problem and asking for clarification.

WP 10c : Use of land in the vicinity of Airports.
The paper was approved.

WP 11a : The length of the grass on Aerodromes.
The original title of the paper was "Length of the grass along the runways". The meeting suggested the title changed to the wording used above.
The paper was approved.

WP 33 : Practical and economical aspects of grassland management.
The paper informed about the experiences gained at the Dutch Leeuwarden Air force base. It had been experienced that the best solution was to mowe the grass several times during the year and to cut the grass rather short. This was due to a number of reasons such as :

./2

- The very fertile soil and the humid oceanic climate.
- Local farmers needed the grass due to shortage of land.
- Certain military requirements.

Mr. Thorpe said that a British investigation had shown that the best solution was the "Long grass solution".

A representative of the Federal Republic of Germany reported that the German experience was that the optimum grass length would have to be decided upon according to the soil. The representative will provide the Vice Chairman with more detailed information in the very near future.

The Chairman noticed that the additional benefit obtained by a very intensive utilization of the area was about 50.000 Dutch guilders. This amount of money was very small compared to the amount of money involved in bird strikes.

The meeting concluded that though the "Long grass solution" was generally applicable, attention must always be paid to local conditions.

Mr. Buurma RNAF promised to supply information regarding the Dutch Air Force because the questionnaire had only been answered for Schiphol and only for some points.

WP 11b : Sanctuaries in the vicinity of Airports.
The paper was approved.

WP 11c : Trees and bushes in the vicinity of Airports.
Several members explained that there was a growing tendency to establish wood areas as a protection barrier against aircraft noise and smells from exhaust products. Such wood areas may increase the bird strike risk.

3.3.2 Chemical repellents.

WP 12a : Use of chemicals to make the soil of Airports'surroundings unattractive.
A Representative for the Federal Republic of Germany informed the meeting about the experiences gained during experiments. All experiments with chemicals were now abandoned in the interest of the environment. The representative mentioned will provide the Vice Chairman with details about these experiences.
The paper was approved.

WP 25 : A report from the Froebel Institute.
The author of the paper, Mr. Martyn Riley, presented the paper which reported about a chemical repellent called SAAS. This chemical agent had been used for the protection of fruit farms against birds. Though the results were preliminary, the paper was optimistic regarding the effect of SAAS. Mr. Riley informed that SAAS was identical with another chemical agent known as RETA.

./3

Several members expressed the view that the results of the paper were much more optimistic than the experiences gained through tests at different airports.

Mr. Thorpe informed about tests being carried out in UK. The results of these tests so far available were not likely to encourage the application of RETA.

WP 28 : Current trials of RETA bird repellent.
This paper reported about French experiments being carried out at Marseille-Marignane Airport.

The Aerodrome Working Group will collect the results from the British and the French experiments as well as the results of all other experiments which will become available.

After a long discussion on the subject "chemical bird repellent" the Aerodrome Working Group agreed on the recommendations set out below :

Recommendation to the BSCE :

1) There is as yet no scientific evidence that the application of chemical agents work as birds repellents on airports.
2) There is a need for properly conducted scientific monitored experiments, which can decide if chemical agents repel birds on airports.

3.3.3 Pyroacoustical devices.

WP 12b : Bird dispersal devices.
The prices indicated in the paper for equipment will be deleted. They will be replaced by an approximative minimum price.

It was decided, as a result of the discussions, that information should be collected regarding such subjects as :

Total expenses relating to bird strike preventive measures.
Manpower employed in relation to these measures.
Organization of the different tasks in relation to these measures. (People working full-time or part-time with bird strike prevention).
Education of the personnel working on bird strike prevention.

WP 12c : Organization of the scaring away of the birds.

Use of Fixed Installations or Mobile Units.
Mr. Lind asked how it was possible to cover a 3-4000 meter runway by applying fixed installations. The French delegation explained that fixed installations were used in areas having a potential risk and did not cover the entire runway. The use of fixed installations were motivated by economic considerations.
The paper was approved.

./4

WP 27 : Measures available to the Airport Management for the reduction of the bird strike risk.
The paper was approved.

The meeting discussed what should be done with the information contained in working papers 10a - 12c incl. and 27. It was recommended that :

Recommendation No 3

The Chairman will draft the papers into one paper. This paper shall be made available to all interested parties and the BSCE Chairman is asked to send the paper to different international organizations.

3.3.4 Further improvement.

Information about names and addresses of the persons who have been responsible for answering the questionnaire will be included.

The question of blacklisting of airports having inadequate bird strike prevention measures was raised. No member of the Working Group could support such a procedure and several members warn against all the difficulties which such a procedure could lead to.

During the main meeting WP 31 was referred to for WG consideration. It was stated that an english translator will be available soon thus enabling the group to study it at the next meeting.

It was revealed during the discussions that, in order to be able to evaluate the effect of certain measures or to evaluate the situation at a given airport, it was necessary to have information about both the bird strike rate and the bird strike preventive measures used. The Meeting recommended that :

Recommendation No 4

The Chairman of BSCE is asked to contact the European Civil Aviation Conference (ECAC) and to ask for the assistance of this organization in collecting information about bird strike preventive measures applied at European airports.

3.3.5 If an agreement is reached with ECAC regarding this matter a draft questionnaire will be worked out by the Chairman of the Aerodrome Working Group.

ATTACHMENT A

AERODROME WORKING GROUP

List of Participants

NAME	ADDRESS
Kurt Pedersen Chairman aerodrome working group	Copenhagen Airports Authority Copenhagen Airport DK 2770 Kastrup Denmark
Hans Dahl Vicechairman aerodrome working group	Luftfahrtsdirektoratet Codanhus, Gl. Kongevej 60 DK 1850 KBV V
AM Glennung	Copenhagen airports authority Denmark
Johnny Karlsson	University of Lund Ecology Building S-223 62 Lund Sweden
Lars-Olof Turesson	Board of Civil Aviation Fack 60101 Norrköping Sweden
J.F. Autzen	Tactical air commando Denmark Koelvraa 7470 Karup J. Denmark
Bent Junker-Hansen	Game Biology Station Kalø 8410 Rønde Denmark

NAME	ADDRESS
Hans Lind	Zoological Laboratory Universitetsparken 15 2100 Copenhagen Denmark
Dieter Brüssow	Luftwaffenamt/Genflsichhbw Postfach 902500/501/07 5 Köln 90 / Germany
John Thorpe	Civil Aviation Authority Brabazon House, Redhill Surrey, England
J.G. van Dusseldorp	Department of Civil Aviation Plesmanweg 1-6, The Hague The Netherlands
J. Heijink	RNAF Air Staff Post box 90501 2509 LM The Hague
L.S. Buurma	RNAF Air Staff Post box 90501 2509 LM The Hague
Bruno Bruderer	Schweiz. Vogelwarte CH-6204 Sempach
Jean Claud Albert	DGAC / sfact 93 Bd du Montparnasse 75270 Paris Cedex 06
J.F. Boomans	Meteorologische Wing-Luftmacht Lange Enkstraat 86 - 1970 Wezembeek Belgium
Sidney A. Gauthreaux, Jr	Department of Zoology Clemson University Clemson, South Carolina 29631 U.S.A.
Elisabeth Dallo	D.G.A.C. Service économique international 93 Bld. Montparnasse 75006 Paris France

NAME	ADDRESS
V.E. Ferry	Direction Générale de l'Aviation Civile 93 Bd. du Montparnasse France - 75006 Paris
Jean-Claude Sonnette	Cometec - SNPL Orly-Sud No 213 94396 Orly Aérogare CEDEX France
Jacques Sanche	IFALPA Interpilot House 116 High Street Egham, Surrey TW 20 9HQ
Dr. W. Wistermayer	Ministry of Transport Elisabethstrasse A-1010 Wien/Austria
Lüthi Max	Abteilung der Militärflugplätze 8600 Dübendorf / CH
B.O. Rüthy	IFATCA Bürenstr. 158 CH-3312 Fraubrunnen Switzerland
Dr. Werner Keil	German Bird Strike Committee Steinauer Str. 44 D-6000 Frankfurt / M61
Jean Michaelsen	Zoological Museum Sarsgate Oslo 5, Norway
Jean Delanghe	Regie des Voies Aeriennes Direction Exploitation 41, Av. des Arts Bruxelles , Belgium
Theo Schwarzenbach	ex. Swissair Capt. Observer Rumlikon CH-8332 Russikon
A. Attig	I.G.A.C. 246 Rue Lecourbe F - Paris 15e

ACTIVITIES OF THE WORKING GROUPS

1. Title: Analysis

2. Recommendations from the 12th Meeting, Paris October 1977

2.1 As the repair cost of bird damage is an excellent guide to the seriousness of the problem, all countries are again asked to provide their costs, if possible, making it clear whether it includes parts, labour or lost revenue. (Note: The Analysis Form on Cost is being revised). A special study should be made of examples of engine and airframe damage.

2.2 Although it appears that the use of lights during daylight may reduce bird strikes, further study should be made of the effect of lights during take-off at night. The proposed US work on the effect of lights on birds is welcomed.

2.3 The Working Group firmly supports the Canadian photographic research of flock densities as a means of defining engine design requirements.

2.4 It is recommended that reports about Serious bird strike incidents should continue to be sent quickly to the WG Chairman for dissemination.

2.5 All countries are recommended to note that the Stockholm meeting in 1975 agreed that for the time being the ICAO definition of a bird strike (from ICAO State Letter AN3/32-71/150 of 28 October 1971) would be used:

"A bird encounter is considered a confirmed bird strike if it leaves, on the aircraft concerned, a trace of bird impact, or ingestion into the engine, and this either

a) in the form of damage to the aircraft; or

b) where no damage occurs, a blood smear or bird tissue or feathers visible somewhere on the aircraft."

(Note: The above unfortunately omits impacts felt by aircrew or seen by ground personnel, and bird carcasses with impact evidence found on aerodromes).

3. Progress Report

3.1 H van Dusseldorp was confirmed as the Working Group Vice-Chairman.

3.2 Notes of the major points from the Paris WG Meeting were sent to those attending the meeting, in addition to the Chairmen of the other WG's.

3.3 The revised form on Cost was sent to appropriate members. More information on cost has now been obtained.

3.4 The following countries have supplied their Analysis in BSCE form since the Paris meeting:

CIVIL	1976	1977	MILITARY	1976	1977
Austria	/	/	Denmark		/
Belgium	/	/			
Denmark	/				
France	/	/			
Germany	/		Netherlands	/	/
Netherlands	/		Norway	/	
Sweden	/	/	Sweden	/	
Switzerland	/	/	USAFE	/	
UK	/		UK	/	

Other countries will be sending their 1977 data shortly.

3.5 The Paper "Bird Strikes During 1976 to European Registered Civil Aircraft", has been produced by the WG Chairman and Vice-Chairman. It contains data from over 1500 incidents.

3.6 The WG Chairman attended the ICAO Workshop on Bird Hazards held in Bangkok in March 1978, and presented a Paper "Bird Strikes in South East Asia/Pacific Region". This was based on ICAO and BSCE data for 1975 and 1976.

3.7 In response to the request on cost sharing of the proposed UK bird strike computer data base, the following countries have either agreed or expressed their support pending final cost figures: Denmark, France, Netherlands, Sweden and Switzerland.

3.8 The Chairman has circulated further information with regard to computer codes, and the possibility of an ICAO bird data storage and retrieval system. The current Australian and Canadian systems have also been examined. At the 1978 WG meeting it was agreed to use a system similar to the Australian one. This tabulates the bird species against each of the features eg. aircraft type, aerodrome, altitude, part struck etc. In general codes are not used, and the bird species are in English and Scientific names.

3.9 Work has been started on a multi-language table of bird names, which will include the bird's mean weight.

3.10 Issue 3 of the Bulletin of Serious Bird Strike Incidents to Civil Aircrafts was circulated on 10 March 1978. Issue 4, which will include the B-737 accident in Belgium on 5th April 1978, and the B-747 incident at Lyon, will be made available in the near future.

3.11 The Military analysis forms are being revised to get round the security problem. The information of general interest will still be available to BSCE. Analysis of Bird strike to Military aircraft during 1976, has been produced.

3.12 UK data for 1976 and 1977 does not show that the use of lights during take off at night causes bird strikes.

3.13 Some features of the Civil Analysis, use of lights, weather and speed - bird weight - damage, are being discontinued.

3.14 The work on engine damage due to bird strikes will be continued, and all members are asked to send the WG Chairman details of engine damage.

3.15 The WG Terms of Reference have been revised and are now "Collection, analysis and circulation of statistical information relating to bird strikes".

<u>Participants</u>

J. Thorpe - Civil Aviation Authority, UK (Chairman)
H. Van Dusseldorp - Dept. of Civil Aviation, The Netherlands (Vice Chairman)
A. Attig - IGAC, France
J. Karlsson - Ecological Institute,Sweden
B. Von Schantz - Board of Civil Aviation, Sweden
JC. Sonnette - Cometex-SNPL, France
K. Pedersen - Copenhagen Airports Authority, Denmark
J. Sanche - IFALPA, UK
L. Sindely - IFALPA
L. Buurma - RNLAF, The Netherlands
T. Schwarzenbach- Switzerland
B. Larsson - Sweden
E. Wittman - USAF, US
V. Ferry, DGAC, France
H. Lind - Zoological Laboratory, Denmark
L. Turesson - Board of Civil Aviation, Sweden
B. Junker-Hansen- Game Biology, Denmark
J. Autzen - Tactical Air Command, Denmark
H. Dahl - Luftfarts Directoratet, Denmark
A. Glennung - Copenhagen Airport Authority, Denmark
W. Schabram - Delvag, Germany
J. Becker - Germany Military Geophysical Office, W. Germany
E. Dallo - DGAC, France
C. Neveux - STAe, France
J. Albert- DGAC, France

30 July 1978

ACTIVITIES OF THE WORKING GROUP

1 - Title : Radar Working Group

2 - Recommendations of the 12th meeting (Paris - October 1977)

a) Recommendations of the WG to the Committee

- In agreement with the last years recommendation the Working Group stresses again that as long as possible raw radar data should be made available for the study of bird movements through the ATC system.

  Recognizing that civilian ATC systems are increasingly relying on Secondary Surveillance Radars which cannot detect birds, the WG considers that it is necessary to seek additional sources of raw radar information on bird movements to supplement the loss of primary radar information from civil ATC systems. Accordingly it is recommended that more use be made of military radars and weather radar for the observation of bird movements.

b) Recommendations submitted during the main meeting

- The need to improve the active collaboration in bird migration research in Europe is recognized. As a first step to improve this situation it is recommended that France, Germany and Switzerland co-ordinate their observations of bird concentrations along the Alpine ranges to establish the length and breadth of this migratory movement which may constitute a collision hazard.

3 - Progress report on the work done during the last year

All countries continue the work reported on during last BSCE meeting. Updated information was given by the delegates of the following nations :

The Netherlands :

The adaptation of the Danish "Faust" system is now called "KIEVIT" and will be ready for first tests in autumn 1978. Besides that large amount of data on densities, heights and flight directions have been collected.

Sweden :

A new project including radar tracking, visual observations and aircraft tracking was accomplished.

4 - Report on discussions, conclusions and recommendations

The main aim of discussions was to find out what application of radar for bird hazard reduction

- is actually in use
- is (or was) in experimental use
- is judged possible
- could be imagined (even if judged utopic at the moment)

Two discussion papers were available as background information :

- Extract of "The bird strike problem and the suggested use of radar" UK Bird Committee Report No 2, May 1974
- Possible use of radar for the prevention of bird/aircraft collisions. ICAO Workshop on reducing bird hazards, Bangkok March 1978

4.1 Operational use of radar information for bird hazard reduction

4.1.1. Military aviation

Federal Republic of Germany : Three to ten long-range radar stations taking polaroid photos every three hours (in case of heavy migration every hour). No systematical height recordings are made. Usual observations are used as an additional source of information. The two sets of data are evaluated in a center. In case of bird density 4 to 8 a BIRDTAM is issued through the meteo network. The time delay between taking the photos and reaching the addressees through the met net may be about 30 to 45 minutes; until reaching the abroad addressees it may take 2 to 3 hours. The success is difficult to judge; but Dr. Becker will try to work out statistical comparisons for next meeting, taking into account changes in operations.

Denmark : The electronic counting system "FAUST" is now mounted on two radars. BIRDTAMS are delivered every 2 hours with a delay between measurement and arrival at the users of 5 to 15 minutes. On request they give information by telephone.

Three years ago, after the introduction of the system and appropriate flight restrictions, at least a decrease of 30 % in the rate of damaging strikes could be seen.

Belgium : One radar station with a semi-automatic counting system (reducing the time of gathering the data and eliminating human errors in quantification) is in use. A BIRDTAM is issued when density reaches 5 to 8 (using the principle "no news - good news"). Further information is given by telephone. They claimed to have reduced the rate of damaging strikes by 50 %.

France : A complex system of civil and military radar information is used to serve the inland stations. Height information is given by the military stations. Not all the information can be sent abroad for security reasons.
No judgement of success.

Norway : Polaroid photos are being taken at one military radar station in southern Norway. Irregular messages are sent abroad.

Sweden : Three military weather radar stations are used as a support for the forecast system in use. Heights are estimated based on experience with radar height finders. All information is summarized on maps and transmitted every morning in the manner of meteo maps.
The rate of damage was lower in 1977 than before (preliminary result).

The Netherlands : For the last 3 years measurements of migration intensity have been made using a military ATC radar. The messages are based on radar findings, meteorological data, and ornithological knowledge, and are transmitted to all stations in and out of the country every 2 to 3 hours when the density of migration is 5 or higher. Every morning before operations, all stations are informed of the measured and expected density, if possible, by use of a conference telephone system. No height information has been included till present. RNLAF updates the regulations for operations in connection with the use of the electronic counter in the near future.

USA : No operational use.

UK : No operational use.

Switzerland : No operational use.

4.1.2 Civil aviation

In France and in West Germany civilian radars are included in the bird detection network. In many countries BIRDTAMS are distributed to civilian aviation for information, but is not a part of operational practice.

The matter of civilian interest in bird hazard warnings, and the possibilities of air carrier pilots' taking avoiding actions was discussed from the pilot' s viewpoint (cf. WP 38). No agreement was reached. Captain Schwarzenbach agreed to prepare a paper on this subject for the BSCE 14 meeting.

4.2 There were no communications regarding experimental programmes using radar for bird strike reduction.

4.3 Proposals for future use of radar in reducing bird hazards

One approach to reducing the bird strike problem in the United States is taking the form of emphasizing the observation of bird migration using radar and the development of a radar ornithology manual for the instruction of air traffic controllers. Another possibility concerns a unit that will sound an alert in the ATC operations' room when migration densities reach severe levels.

4.4 New ideas

- To investigate the use of SODAR (Sound Detecting and Ranging) or accoustical sounding equipment in bird detection in the atmosphere (a short report will be given at the 14th meeting of BSCE).
- To further examin the use of image-intensification equipment for bird detection at night near and on airfield. (A detailed report at the 14th BSCE meeting will be given by Dr. Gauthreaux).
- To examin the use of infrared viewing equipment for bird detection.

4.5 Discussion of WP 34 by Drs. L.S. Buurma (RNLAF)

This paper stimulated considerable discussion and it was concluded that there is a great interest in more co-operation between countries concerning the following points :

- only actually measured migration data should be included in the BIRDTAM

- that general migration information should be compiled in a booklet and not put in BIRDTAMS
- the standardization of height information is needed (a proposal will be prepared)
- to generate better co-operation in establishing regional radar networks for proper monitoring of bird movements (cf. recommendation below).

ATTACHMENT

List of Participants

NAME	ADDRESSES
L.S. Buurma	RNCAF-Air Staff The Hague, Netherlands
AM Peeraer	Leidschendam, The Netherlands
I. Tengeler	Laboratory for Eletronic Developments of the Armed Forces The Netherlands
Sidney A. Gauthreaux, jr.	Department of Zoology Clenson University Clenson South Carolina, U.S.A.
Johnny Karlsson	University of Lund Ecology Building S-22362 Lund, Sweden
Bertil Larsson	Väderavdelningen F5 S-26070 Ljungbyhed, Sweden
Lars-Olof Turesson	Board of Civil Aviation Fack 60101 Norrköping, Sweden
Bertil von Schantz	" " "
Jan Michaelsen	Zoological Museum Sarsgate 1 Oslo 5 / Norway
Jacques Sanche	IFALPA 116 High Street, Egham, Surrey England
Jean Claud ALBERT	DGAL / IFACT/TU Paris / France
Jean-Claude SONNETTE	COMETEC-SNPL Orly-Sud No 213 Orly, France

NAME	ADDRESSES
Mlle Elisabeth DALLO	D.G.M.C. S.E.I. 93 Blvd. Montparnasse 75006 Paris, France
V.E. Ferry	DGAC/Cab 93 Bvd. du Montparnasse 75006 Paris, France
T.J. Jacobs	Provinciebaan 4 9744 Gavere Belgium
M. Lüthi	Abt. d. Militärflugplätze 8600 Dübendorf
B.O. Rüthy	IFATCA Bürenstrasse 158, CH-3312 Fraubrunnen Switzerland
H.J. Eberhardt	Hochschule für Technik Dept. Electrical Eng. D-2800 Bremen 41 West Germany
J. Heijink	RNLAF-Airstaff Postbox 90501 2509 LM The Hague Netherlands
Dr. J. Becker	German Military Geophysical Office Mont Royal 5580 Traben-Trarbach West Germany
J.F. Autzen	TACTICAL AIR COMMANDO DENMARK KOELVRAA 7470 KARUP J., Denmark
Maj. Dieter Brüssow	Luftwaffenamt/ GENFLSICHHBW Postfach 902500/501/07 5 Köln 90, W. Germany
Th. Schwarzenbach	ex. Swissair Capt. CH-8332 Russikon, Rumlikon Switzerland

ACTIVITIES OF THE WORKING GROUP

1. Title : STRUCTURAL TESTING OF AIRFRAMES

2. Introduction

The Working Group was reminded of the terms of reference, namely :

Terms of Reference

(i) To exchange information on the results obtained from :

a) Bird impact research testing of materials, structural specimens, windscreens, etc.

b) Tests to show compliance with Civil Airworthiness requirements.

(ii) To discuss and evaluate the information in order to provide design guidance material for satisfactory methods of producing bird impact structures, windscreens, etc.

(iii) To exchange information on analytical work.

(iv) To establish liaison on future research programmes in order to avoid duplication.

3. Working Group and Committee Recommendations from second meeting of Group (Paris 21st October 1977)

Committee

D1. That, in view of the lack of response of participating countries, with the exception of France and the UK, in forwarding any information to the Working Group as requested at the last meeting, a member should be appointed by each participating country to be responsible for reporting to the BSCE progress in support of the recommended tasks of (1) and (2) as follows of the Working Group.

D2. That the attention of pilots and operators should be drawn to the deterioration in bird impact resistance of windscreens which rely on the maintenance of an optimum temperature for strength if

- insufficient time is given for warming up the windscreen before take-off, or
- the temperature is too high because the aircraft has been parked in the sun.

Working Group

1. That, in support of (i) and (iv) of the terms of reference, members should supply to the Chairman of the Working Group,

a) results of any bird impact structural testing together with geometric details which have been completed by their organizations,

b) details of any future testing programmes by their organizations.

2. That, in support of (ii) and (iii) of the terms of reference, members should supply the Working Group Chairman with details of any method of analysing the bird impact resistance of structures correlated as far as possible with testing experience which have been done by their organizations.

3. That the future continuation of the Working Group be judged against the response of the participating countries to these recommended tasks of (1) and (2).

4. That the attention of the Analysis Working Group be drawn to the need for adequate information on the spatial distribution of birds within a flock for the large bird sizes, to enable a check to be made on the assumption that multiple bird strikes can be considered to be covered by the present single bird strike requirements. (This was supported by the aircrew representatives).

4. Progress report

This present meeting spent its time reviewing progress against these recommendations. Although no country as yet had nominated a member in response to Recommendation D1 of the Committee it was agreed that this need was the most orderly way of sustaining the Group's activities, and that, in the hope for a more positive response, the request should be directed instead to the national committee for bird strikes of each participating country.

With regard to Recommendations 1 and 2 of the Working Group, the continuance of these is supported, but it was agreed that the eventual production of a Manual giving design guidance based on these contributions must, from a practical point of view, consist of a compendium of the reports produced by the various participants; expect that where the results can be merged or inconsistencies resolved this should be accomplished by participants between meetings. By this means, the aim is that the Manual will be a living document which can be added to and amended as necessary as fresh evidence arises. A first version of the Manual can be compiled from the material already presented by France and the UK and it was agreed that these countries will meet to compare their work with this aim.

It is not considered necessary to retain Recommendation 3 of the Group as it is felt that it is equally important for the Group to exist for the purpose of exchanging information according to the existing terms of reference. Recommendation D2 of the Committee and Recommendation 4 of the Working Group are retained in view of their importance.

The present meeting discussions centred around the presentations by France of the following reports :

1. "Etude de la Résistance des Structures aux Impacts d'Oiseaux" by B. Delor, CEAT.
2. "Exploitation des Tirs d'Oiseaux à Grande Vitesse sur Structure d'Avions Métalliques" by J. Besse, Marcel Dassault-Bréguet Aviation.

Both these reports give in more detail the evidence already related at the 12th Meeting.

Important additional points made are :

1. The mathematical form of the various empirical formulae developed by the RAE in report TR 72056 for structures and in the preliminary report on windscreens made by P.F. Richards at the 12th Meeting are confirmed except that some small adjustment to the coefficients would be necessary to eliminate some optimism compared with the French results.

2. The use of an internal metal splitter for wing and empennage leading edges is of greater benefit than increasing the nose skin thickness and leads to a significant weight saving.

3. The independent analysis made by Marcel Dassault tends to confirm that the energy generated normal to the structural surface can be correlated with the area of the section destroyed, provided that account is taken of the effective part of the bird which hits the structure. This analysis also allows the trajectory of any part of the bird remaining after penetration to be calculated. The method also allows account to be taken of possible bird splitter characteristics of the structure, which may tend to restrict damage resulting from larger bird impact. On the other hand, a concave shaped structure would tend to concentrate the effective energy to be absorbed. The elastic strain calculated, however, does not correlate with the known mechanical properties of the material and more investigation is required to understand the reason for this.

4. It is believed that the use of a gun for bird impact testing may be conservative, particularly when the frontal area of structure being struck is small when bird wing spread is taken into account. Comparative tests with rocket sled would help to understand these effects.

5. CEAT is intending to investigate the energy approach by a further test programme, including the effect of glancing shots, the trajectory deviation of bird remains following penetration and the use of internally placed shock absorbers, such as honeycomb.

6. Comparative tests were made in the US on horizontal tail leading edges of several transport aircraft, such as the DC-8, to determine their bird impact resistance, and it was these results that lead to the 8 lb. bird requirement in FAR Part 25. FAA are to be approached by the Chairman to obtain this evidence.

A paper was also presented by MBB Germany, entitled "Bird Strike Tests with Radomes and Windscreens of the HFB 320 Hansa Jet and Transall C 160" by H. Kuckuck. This summarised the results of bird impact tests for certification purposes and MBB agreed to make the details available, also to compare results with analysis from the UK and French analytical formulae.

./4

Saab of Sweden made a verbal presentation of intentions to make bird impact tests on a Viggen JA 37 on the rocket sled facility at Holloman Airforce Base in the US. This opportunity is presented since seat ejection tests are required. The intention is to find the relationship of bird size capability with forward speed for clearance of present and future designs. It is believed to be highly desirable to compare these results with gun tests, but the possibility of such further tests is unresolved. Results may be available by autumn 1980.

It was reported by the US member that comparative tests on rocket sled and gun were made on the F 111 windscreen and gave comparative results. The windscreen was cleared for a 4 lb. bird impact capability at M=1.15 at approximately 3,500 ft. altitude. The US member agreed to forward the report on the Transparency Conference recently held in Long Beach California, which he felt would be of value to the Group.

The Group were agreed that the greater the extent of design guidance material which could be made available the greater degree of optimisation possibilities for design in judging desired tolerance or otherwise to penetration.

List of Participants at Structures Working Group

PARTICIPANT	ORGANISATION
P.F. Richards	CAA, UK, Chairman
Kuckuck	MBB / Airworthiness Deptm.
Milton Mobärg	SAAB-SCANIA/Flight Safety Manager
J. Heijink	RNLAF-AIRSTAFF Flight Safety Department, The Hague
Bertil von Schantz	Board of Civil Aviation S-60101 Norrkoeping, Sweden
J.F. Autzen	TACTICAL AIR COMMANDO DENMARK
Johnny Karlsson	University of Lund Ecology Building S-22362 Lund, Sweden
John Thorpe	CAA, UK
Bertil Larsson (partly participating)	Väderavdelningen F5 S-26070 LJUNGBYHED, Sweden
Jean Besse	Avions M. Dassault-Brèget Aviation Merignac (Gironde)- FRANCE Chef de Departement Etudes
Bruno Delor	Centre d'Essais Aéronautique de Toulouse TOULOUSE - 31056 - FRANCE
Christiane Neveux	Service Technique Aéronautique Paris - FRANCE
Robert E. Wittman	AIR FORCE FLIGHT DYNAMICS LABORATORY IMPROVED WINDSHIELD PROTECTION WRIGHT-PATTERSON AIR FORCE BASE OHIO 45341, U.S.A.
A. Attig	IGAC, 246 Rue Lecourbe Paris 15

SECTION 6 - Papers Presented

NB : Most of these papers are as provided
by the presenters.

BSCE 13

30 July 1978

Working papers presented at the main meeting

Nr.	Title
WP/3	The identification of bird remains as part of the bird strike reporting procedure
WP/4	Birdstrikes - helicopter in GAF
WP/5	Collisions with birds of prey in the alps
WP/6	The bird strike reporting system in SWISSAIR
WP/7	Bird strikes during 1976 to european registered civil aircraft
WP/8	The computer analysis projet
WP/9	Report from an ICAO workshop on reducing bird hazards
WP/10a	Garbage dumps in the vicinity of airports
WP/10b	Homing pigeons in the vicinity of airports
WP/10c	Use of land in the vicinity of airports
WP/11a	Sanctuaries in the vicinity of airports
WP/11b	Length of grass along the runway
WP/11c	Trees and bushes in the vicinity of airports
WP/12a	Use of chemicals to make the soil of the airport surroundings unattractive
WP/12b	Bird dispersal devices
WP/12c	Organization of the scaring away of the birds including use of fixed installation or mobile units
WP/13	First experiences with gull models at Zurich airport
WP/14	About effects of agricultural and grassland use on airfields - reducing bird populations
WP/15	Approaches to protect endangered areas on airports from bird population by Xironet

Nr.	T i t l e
WP/16	Continous work with the migratory bird forecasting system presented at BSCE 12/WWC3 (WP not available)
WP/17	Large scale weather situations and influence on bird migration during seasons of the year
WP/18	Bird observation at Zurich airport
WP/19	Roosting and feeding flights of black-headed gulls in the region of Zurich airport
WP/20	Biophenological observation and information service in GAF, a helb for birdstrike-risk forecast
WP/21	Operational control of airspeed for minimising bird impact hazard
WP/25	Report on preliminary Laboratory and Field Trials of the Chemical Reppellent Synergised Aluminium Ammonium Sulphate on rodents and, principally, birds
WP/26	Etude de la resistance des structures aux impacts d'oiseaux
WP/27	Measures available to the airport management for the reduction of the bird strike risk
WP/28	Current trials of "RETA" bird reppellent
WP/29	Information paper No 1
WP/30	Le BSCE et les organisations internationales
WP/31	Propositions 1 - sur la nécessité urgente de créer un dispositif d'intervention immédiate sur les aéroports 2 - sur l'adoption d'un ordre de classement des catégories d'incidents, par degré d'importance ou de gravité 3 - sur l'adoption d'un ordre de classement des catégories d'aéroports, par degré de risque progressif ou de danger aviaire caractérisé
WP/32	Some notes on analysis of bird strikes to UK general aviation aircraft
WP/33	Practical and economical aspects of grassland management at some dutch airbases

Nr.	Title
WP/34	The practical use of bird migration warnings
WP/36	Bird strike tests with radomes and windscreens of the HFB 320 Hansa Jet and Transall C 160
WP/37	Exploitation des tirs d'oiseaux a grande vitesse sur structure d'avions metalliques
WP/38	Operational use of bird strike information from a pilots view
no number	Military aircraft Analysis 1976

ADF616112

The identification of bird remains as part of the bird strike reporting procedure.

H. Lind

Zoological Laboratory, University of Copenhagen

It has been recommended by the BSCE (London 1976) that bird remains which are found on the aircraft or the ground after a bird strike has occurred should be identified by ornithologists. This has been done in Denmark since 1974. A bird strike is usually reported by the pilot, whereas the birds are collected by the aerodrome personnel; they are sent to the ornithologist together with a few data on the incident. Thus there are in fact two reporting systems more or less independent of each other. This is probably also the case in other countries.

The Danish reports from 1977 on bird strikes and bird remains originating from bird strikes are compared in table 1. Only about 20% of the total number of recorded strikes is covered by both reporting systems. The best agreement is found in small airports, probably because of easy communication between air and ground personnel.

The incongruity between the results of the two systems stemmed in some cases from failure to report. In two cases the pilots claimed that they had no time to fill in the reporting form, and in two other cases no reports were made even if the aircrafts were

damaged (costs of repair 14,000 and 120,000 $, resp.). Some reports indicated that bird remains had been found, but for some unknown reason they were not sent in for identification. In a number of cases the circumstances of the bird strike have excluded one of the two reporting systems. For instance, the pilot may not have been able to observe the collision because of his strongly restricted view from the cockpit, but the strike was observed from the ground and the birds were found. Apparently this happens rather frequently. Or the pilot observed and reported a strike, but no bird remains could be found afterwards. It is often difficult to find remains on the aircraft, and if the strike takes place outside an aerodrome it is impossible to find them on the ground. 16 (16%) of the incidents listed in table 1 were not observed directly, but dead birds with collision marks were found on the runways. In some of these cases the birds may have been slung down onto the runway without actually hitting the aircraft, and consequently the pilot did not report a bird strike.

If the ICAO definition of a bird strike was used very strictly the number of recorded bird strikes would be rather small. Probably, in most countries strikes observed by pilots are included in the statistics. If also observations made from the ground and records of dead birds on the runway were included, the number of bird strikes would increase further. In the latter case the number of reported strikes in Denmark in 1977 would increase by nearly 100% (table 1). It may be that large differences in bird strike rates between different countries should be explained by fundamental differences in reporting procedures rather than by differences in efficiency.

In order to find the causes of a bird strike it is important to know the bird species involved. Table 2 clearly demonstrates

The increase of information which can be obtained by proper identification of the bird remains. However, this does not mean that information about the bird species in the pilot's report is of no importance, because in some cases it is the only information available.

The collection of all birds found dead after collisions or near-collisions with aircrafts provides a relatively large material of identified collision birds. The number of identified birds which refer to bird strikes reported by pilots is much smaller. Thus, in 1977 63 birds (from 33 incidents) were collected in the Copenhagen airport, and only 10 of these birds came from 7 incidents which had been reported by pilots. The material of identified collision birds from Copenhagen airport includes for the period 1974-77 17 species and 339 individuals. This local statistical information is in several respects useful in regard to the treatment of the bird strike problem in the airport. For instance, it quantifies the bird strike situation and demonstrates changes in the situation. Therefore it helps in identifying the problems and indicates whether the ethological and ecological measures undertaken against certain species have been successful. One example concerning the gulls is shown in table 3. Until now the gulls (especially Herring Gull and Black-headed Gull) are the birds which have received most of our attention. The decrease of gull strikes indicated by the table might be explained by an improved reporting of strikes with small bird species; this is, however, not the case in the Copenhagen airport.

The need for national and international bird strike statistics is obvious and is not questioned. But in some respects the local statistics, as indicated above, are more useful in the practical solution of the bird strike problems of the individual aerodromes and should therefore be as complete as possible. According to a

recommendation by the BSCE (London 1976) the aerodrome where the bird strike took place should be informed. In order to improve the local statistical information it is suggested that the aerodrome should receive not only a copy of the original report but also all further information on the incident, first of all information on the bird species and the costs.

<u>Table 1.</u> Number of bird strikes with civil aircrafts in Denmark 1977 as recorded by reports and by collection of bird remains.

Bird strikes recorded by	Copenhagen airport		Other airports, en route		Total	
collection of birds	26	48%	20	43%	46	45,5%
	7	13%	14	30%	21	21%
pilot reports	21	39%	13	28%	34	33,5%
Total	54		47		101	

<u>Table 2.</u> Comparison of reported bird species and identified bird remains. Bird strikes with civil aircrafts in Denmark 1977.

Information on bird species in reports		Identification of bird remains	Number of reports	
Correct species:	Lapwing	Lapwing	1	1
Correct group: (Genus or family)	Duck	Mallard	1	8
	Gull	Herring gull	2	
	Tern	Common tern	1	
	Gull	Common gull	3	
	Gull	Black-headed gull	1	
No information:	?	Partridge	1	7
	?	Common gull	1	
	?	Lapwing	3	
	?	Kestrel	1	
	?	Skylark	1	
Wrong species or group:	Gull	Oystercatcher	1	4
	Lapwing	Oystercatcher	1	
	Pigeon	House pigeon and Oystercatcher	1	
	Herring gull	Common gull	1	

<u>Table 3.</u> Relative frequency of gull strikes in Copenhagen airport.

	1974	1975	1976	1977
Number of birds killed by aircrafts	142	13	123	63
Number of gulls ---- " ----	130	11	84	18
Number of gulls in pCt.	92%	85%	68%	29%

ADF616113

Birdstrikes on helicopter in German Air Force

Report given by Dr.J.Hild,GAF,5580 Traben-Trarbach,Mont Royal

Some years ago birdstrikes on helicopter were rare, but with introduction of the new helicopter generation such incidents and accidents increased.(Figure 1)

Some figures may document that also for helicopter a birdstrike can be an uncalculated risk. Figure 2 shows the engine nr.2 of a CH 53 damaged by a pigeon and figure 3 the cockpit of an alouette II broken by a pigeon , too.

Analysing the distribution of helicopter-birdstrikes over the months there are not so remarkable picks as on jets. The single pick in summertime could be declared by the higher frequency of flights(figure 4) but movement periods are not to analyse. The flight stages on which strikes happened show an expected maximum up to 200 ft(GND), but the bird species document the real danger for heliocopter by birdstrikes, for pigeons,ducks, gulls, crows and buzzards may induce an accident.

In figure 5 it was tried to calculate the costs of damages and perhaps it is interesting to see that rotor and engine were damaged mostly. Especially in this fact the real danger for helicopters has to be seen.

TOTAL NUMBER OF BIRD STRIKES WITH HELICOPTERS (GAF) 1966 - 1977

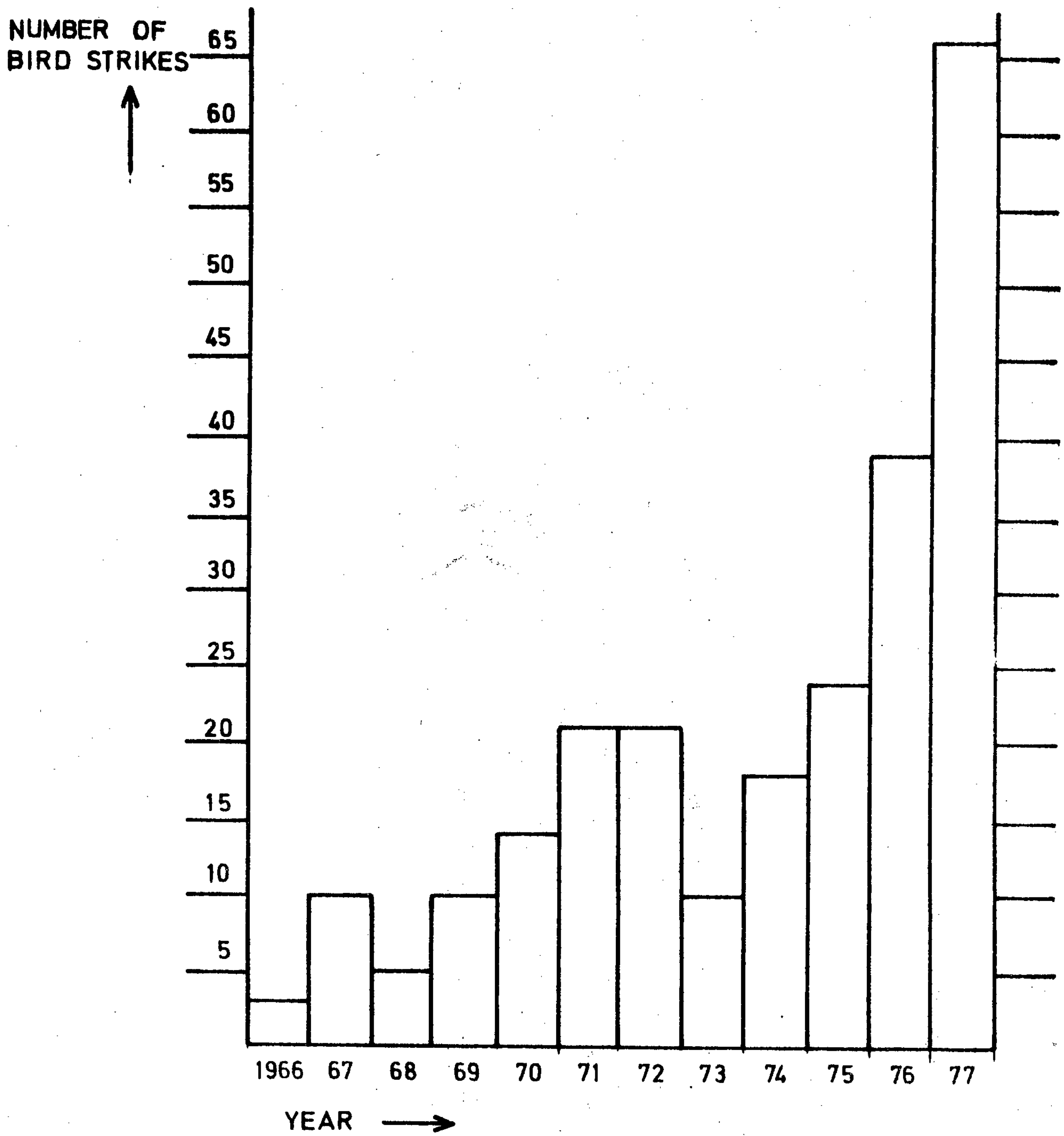
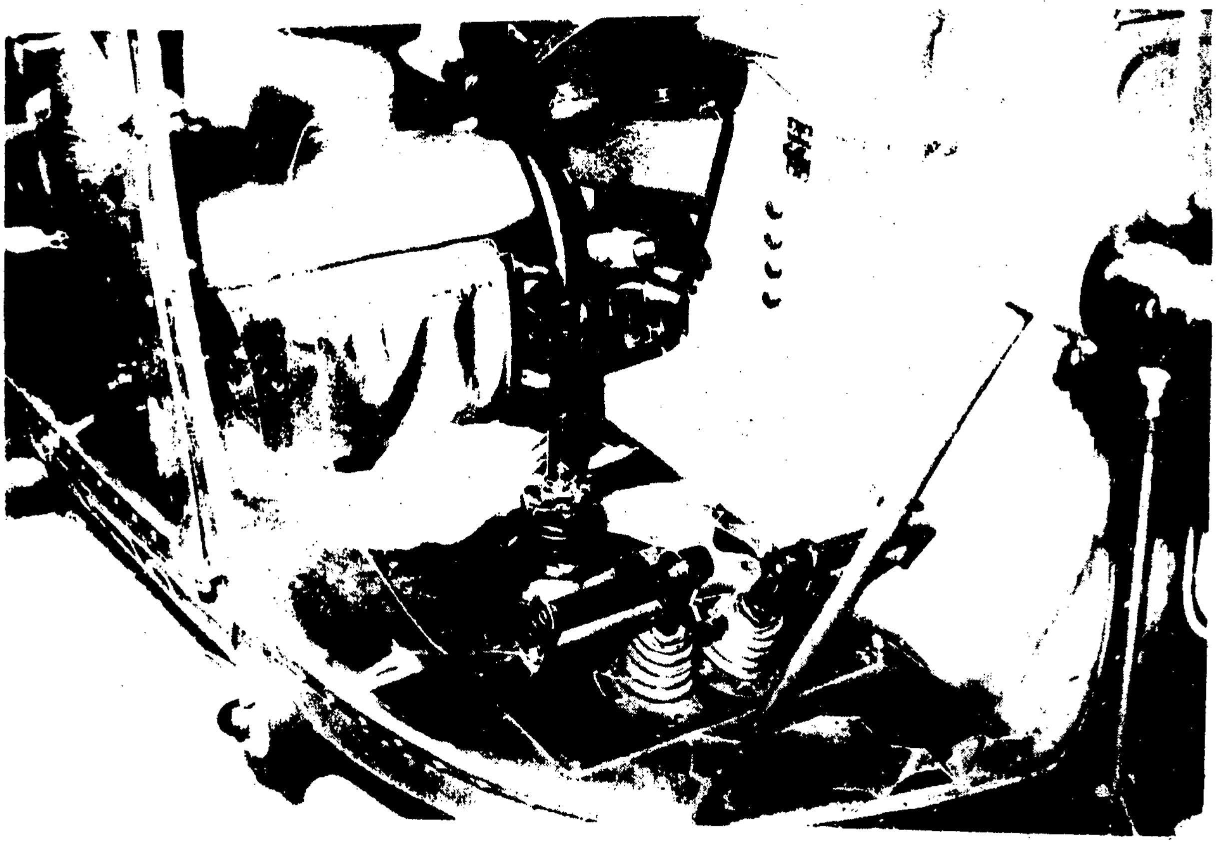


Fig. 2

CH-53 04-05-1977, 1130 GMT
inflight 10 NM SW of Rheine-Bentlage
height 300 ft GND - 120 KIAS
pigeon weight 500 g
birdstrike to engine 2
blades of the first compressor stage damag

Fig.3



AL II   05-09-1977,   1610 GMT

approach to Itzehoe, height 300 ft GND - 65 KIAS, pigeon weight 500 g, birdstrike to Cockpit, Cockpit damaged, pilot without blessure

Fig. 4

Bird Strikes with Helicopters classified in flight level, months and bird species (time of reference 1966 - 1977)

flight stage	J	F	M	A	M	J	J	A	S	O	N	D	total	bird species
landing taking off traffic pattern	1	6	5	1	5	5	7	7	2	10	3	3	55	Buzzard, Gull, Lapwing, Crow, Pigeon, Tern, Swift, Swallow, Skylark
0 - 199 ft	3	3	4	3	7	6	7	8	10	7	6	9	73	Buzzard, Duck, Crow, Pigeon, Blackbird, Yellowhammer, Swallow, Sparrow
200 - 499 ft	0	1	2	2	4	3	7	6	5	7	6	3	46	Buzzard, Falcon, Duck, Pigeon, Redshank, Redwing, Starling, Swallow
500 - 999 ft	0	2	3	2	2	3	6	7	0	0	1	1	27	Crow, Starling, Swift, Swallow
over 1000 ft	0	0	0	0	3	3	3	2	0	1	1	0	13	Buzzard, Swallow
unkown	1	4	2	3	3	4	1	3	3	2	0	0	26	Gull, Duck, Crow, Pigeon, Skylark, Robin, Sparrow
total	5	16	16	11	24	24	31	33	20	27	17	16	240	

Bird Strikes to Helicopters with Damage, 1966 - 1977

1st Sikorsky CH 53 G

engine inspection with damage	1 x	app.	2.500,-- DM
engine inspection without damage	6 x	app.	13.616,-- DM
main rotor blad cap	2 x	app.	2.130,-- DM
cockpit	1 x	app.	952,-- DM
			19.198,-- DM

2nd Bell UH - 1 D

main rotor	1 x	app.	4.840,-- DM
cockpit	2 x	app.	773,-- DM
aiframe	7 x	app.	351,-- DM
			5.964,-- DM

3rd Alouette SE 3130/SA 318 C

engine inspection without damage	2 x	app.	1.520,-- DM
main rotor cap (1 main rotor head with blad change)	33 x	app.	61.194,-- DM
cockpit	15 x	app.	7.670,-- DM
antenna	2 x	app.	458,-- DM
			70.842,-- DM

4th Sea King MK 41

engine inspection with damage	2 x	app.	3.150,-- DM

5th Sikorsky H 34

main rotor blad cap	1 x	app.	310,-- DM

Sikorsky CH 53 G	19.198,-- DM
Bell UH - 1 D	5.964,-- DM
Aluette	70.842,-- DM
Sea King MK 41	3.150,-- DM
Sikorsky H 34	310,-- DM
Total	99.464,-- DM

70

Discussion on WP 4

Junker-Hansen: Have you found any connection between the frequency of birdstrikes to helicopters and their speed? This is of special interest now because a new generation of faster helicopters has begun to come into use.

Hild: It seems as if the higher speed of modern helicopters has made them more vulnerable to collisions with birds. However, this has not been possible to evaluate statistically so far because we have not distinguished between slow and high speed helicopters.

Thorpe: What type of damages from birdstrikes do you think are the most dangerous ones, on the engines or on the fuselage?

Hild: Damages affecting the engines are the most dangerous ones.

AD F616114

Collisions of aircrafts with birds of prey in the Alps

by Bruno Bruderer, Switzerland

Thermals above the plains in the valleys, updrafts along the sunward or windward slope of mountain ridges as well as lee waves offer a variety of climbing possibilities for glider pilots and birds of prey. Glider pilots know that birds of prey soaring in updrafts show usually a pronounced indifference against gliders. Even a large raptor as the Golden Eagle seems to prefer symbolic attacks and flight display instead of real fights. Even individuals of the same species penetrating into the territory of an eagle may pass unattacked if they don't come too close to the eyrie or to a sexually active pair in flight.

Huth (1968, Orn. Beob. 65: 131) gives an example of an incidental collision between a glider and an eagle, fortunately without damage to the plane. It shows that glider pilots have to be aware of the possibility that eagles may alter the direction of circling or the altitude more rapidely than a glider. Pilots of faster aircrafts have to bear in mind that all the different updraft situations in mountain areas are a potential hazard with respect to incidental collisions with birds of prey.

Some recent reports suggest that besides the incidental collisions, large birds of prey may, under certain circumstances, actively attack an aircraft (see below). If this holds true, even a relatively small population of large raptors (e.g. about 100 to 120 breeding pairs of the Golden Eagle in the Swiss Alps) may be a certain risk. By comparison of the known cases we will try to find out under which circumstances attacks occur and how they might be avoided.

Attacks of Golden Eagles to aircrafts

1.) 6 March 1962, C-36 above the Rhone Valley (western Swiss Alps) 1800 m ASL (800 m AGL): A pair of Golden Eagles circling slightly above approach level of aircraft. Suddently one of the Eagles turns towards the aircraft and hits the cockpit in a dive attack.

2.) 12 April 1975, Helicopter Hughes 269 C above the Albula Valley (eastern Swiss Alps) 1700 m (150 m AGL): At the same flight level a pair of Golden Eagles in flight shows the display typical for the maiting season. The Pilot tries to fly around the pair; at a distance of 30-50 m one of the Eagles turns towards the helicopter, strikes the cabine, and is thrown back to the main rotor. The female eagle was killed, the helicopter could

land in spite of the damaged rotor (cf. Bruderer 1976, Orn. Beob. 73, 29-30).

3.) Report by P. Vaysse in "Aéroclub et le Pilot Privé" 42, June 1977, p. 47-48, region of Aspres (French Alps, Dauphiné), 2000 m ASL (200 m AGL) no date indicated: An eagle approaches a number of gliders and shows towards five of them a flight behaviour remembering sexual display: He appears above the left wing, dives in front of the plane's nose, reappeares at the left wingtip and flies along the wing towards the fuselage, Following the last approach the Eagle moves on to the back of the glider, tries to clutch at the fuselage, glides backwards and damages part of the empennage.

4.) February 1978, a "Libelle" glider at 1700 m ASL above the western Italian Alps: An Eagle (described as a three-year-old male of 11 lb. According to the photograph to be identified as younger than 3 years, and according to the given weight of 5 kg to be determined as a female, since males are not heavier than 4,4 kg) dived, wings folded at the plane and bursted through the canopy. (Flight International, March 1978, p. 687)

5.) Described by Gordon (The Golden Eagle, London 1955): It was in deep winter, when in the Scottish Highlands a stag stampeded on seeing an aircraft flying over. The pilot and a pair of Golden Eagles observed the stag getting stuck in a deep drift. The eagles "considered the plane as a rival and attacked it with power dives". (In my opinion the stag in the deep snow was rather coincidence than the cause of the eagles' attacks).

6.) Described by Gordon (l.c.): On a mission of shooting eagles by plain (!) in Texas a small piston aircraft flew directly towards an eagle from a slighly lower level than the bird. The eagle dived and bursted through the cockpit. (This case is not directly comparable to the others).

The common features of the five comparable cases are:

- where the date is known, it is in early spring, i.e. in the maiting season (cases 1, 2, 4 and possibly also 5)
- in the cases 1, 2 and 5 pairs of eagles were engaged. In one of them an exellent description of the behaviour of the pair prior to the attack is available, which shows clearly that the pair was sexually displaying. The single bird in case 3 shows flight manoeuvres remembering flight display. Case 4 seems to be a young bird (roaming around on search of a territory) which always has to be ready to escape or to fight when coming too close to a territorial pair.

- in all cases the bird was prior to the attack at the same or a slighly higher level than the aircraft.
- in no case is there a hint to the immediate proximity of the eyrie.
- in 4 out of 5 cases of real and successful attacks (1, 2, 4, 6) the cockpit was attacked.

Comparison with other species and intraspecific fights

Two attacks of Common Buzzards got to my knowledge (a careful search would certainly bring up more); their similarity to the eagle attacks is striking:

1) 24.7.76, glider TCV o2 in the region of Aspres (French Alps) 1600 m ASL (800 m AGL): A pair of Common Buzzards in the same thermals. Suddenly the plain gets a good push of thermal lift, and - did the birds feal threatened? - one of them turned back, flow a frontal attack towards the cockpit and crashed at the plane's wing, 70 cm to the right of the cockpit. (Vaysse l.c.)
2) 27.5.71 region of Biasca (southern Swiss Alps): A Common Buzzard glides in a flight behaviour as in sexual display along a rock face and dives several times with closed wings in at least symbolic attacks towards an aircraft flying very close to the ground (A. Schifferli and P. d'Alessandri, pers. comm.)

Three out of four intraspecific fights of Golden Eagles reported by Gordon (l.c.) were observed in spring, the fourth in July (after the fledging of the young). Three intraspecific fights in the Swiss Alps had been reported from spring, two from autumn (after the young had become independent). (Müller 1975, Sutter 1975, Orn. Beob. 72, 115-117).

Glutz, Bauer and Bezzel (in Handbuch der Vögel Mitteleuropas, Frankfurt 1971) state that apart from these heavy struggles a somewhat increased aggressiveness may occur in the vicinity of the nest.

Conclusions

1. In spite of the pronounced indifference of soaring eagles towards aircrafts, glider pilots should allow for rapid directional or altitudinal changes in the flight of eagles. Pilots of faster aircrafts should take into account that mountains with different updrafts are prefered areas of soaring raptors.
2. Attacks of eagles seem to occur when an aircraft approaches a sexually displaying pair (undulating flights: changing phases of upward spirals, diving and gliding) especially when the aircraft is at the same ore a slightly lower level.

   Flight display may occur in every season, most pronounced from January to

May, somewhat less after fledging of the young and in autumn when the young become independent. It is as frequent at the edge of the territory as in the vicinity of the nest.

3. Attacks by eagles might also be provoked when an aircraft comes into a critical distance from a bird (in the order of 100 m ?), especially if the aircraft flies from a lower level directly towards the eagle or performs a rapide change in altitude.
4. The pilot should keep in mind that intraspecific fights also occur in the vicinity of the nest. Most of the nesting sites are at heights of 1000 to 2000 m ASL (lower than the preferred hunting area), in the slope of large valleys or the exit of small valleys, usually in the upper part of steep rocky walls with free approach.

As a general rule for the pilots one could say: "Fly higher than the eagles!"

Acknowledgments

I wish to thank my collegues H. Haller for valuable discussions on the behaviour of Golden Eagles and to L. Schifferli for correcting the English text.

Discussion on WP 5

Thorpe: It is well known that birds of prey often attack small aircraft also in Africa and in other parts of the world.

Ferry: Is it perhaps worth while to try to get further material about these conditions?

Bruderer: Further studies should be welcomed.

Brüssow: My opinion is that birds scarcely attack aircraft. They always dive if they get sight of an aircraft.

Bruderer: There is no doubt that statements on attacks of birds on glides are true.

Brüssow: This indicates a further advice to climb and turn to the left when getting sight of birds.

Bruderer: The dicussion here has confirmed the truth of the sentence of my paper: "Fly higher than the eagles."

ADF61615

BIRD STRIKE COMMITTEE EUROPE

BERNE, May 29-June 2, 1978

Ref: BSCE/13 - WP 6

THE BIRD STRIKE REPORTING SYSTEM IN SWISSAIR

Capt. T. Schwarzenbach, Zurich

SUMMARY

The bird strike reporting system in Swissair is described, emphasizing the storage of all bird strike information under a separate code in the computerized maintenance control system (MCS).
Comments are made on the efficiency of the reporting and on the priorities of future activities.

BIRD STRIKE COMMITTEE EUROPE

BERNE, 1 June, 1978

Ref: BSCE/13 - WP 6

THE BIRD STRIKE REPORTING SYSTEM IN SWISSAIR

1. History In the early Sixties, when Swissair's fleet became an all-jet-fleet, the damage to engines and aircraft through foreign objects was increasing considerably. The analysis showed clearly - amongst others - an increasing number of bird strikes being the cause of the damage.

So, the damage to aircraft initiated the recording of bird strike occurrencies within the airline.

Evidently other airlines had the same problem and - as you all know - national committees and international contacts were established to tackle the problem of bird strike in its entire complexity.

In May 1970 the "Swiss Bird Strike Committee" was founded. A Bird Strike Report Form was created by the Federal Air Office and was distributed to the Flight Information Offices of airports. As little use was made of this form, it was assumed that a better response could be expected if the airlines themselves were approaching their pilots and if the form was available in the cockpit of every aircraft. Swissair made then its own draft for a reporting form, which was completed by the Ornithological Station at Sempach for ornithological information and - since 1972 - the form is being stored in the ships library of every Swissair aircraft. In the meantime this form has once been revised to add the switching-on of landing lights.

2. Reporting System

For convenience I shall call this form the "Pilot's Report" to distinguish it from a second form to be called "Maintenance Report". A third source of information on bird strikes is the Aircraft Technical Log.

2.1 The Pilot's Report has to be filled in by the pilot whenever a bird strike had occurred or was suspected. Near-misses are also to be reported by this form.

The form is delivered to the Chiefpilot's Office, where 5 copies are made; the original is filed in a special bird strike file; 1 copy is sent via our IATA/ICAO - coordinator to the IATA - Office.

The remaining 4 copies go first through the office of the Flight Operations Assistant, primarely for information, and if necessary for publishing of procedures in the Flight Operations Manual or of informative articles in the Chief Pilots Bulletins.

All four copies go then to the Manager of Maintenance Engineering who is Swissair's coordinator for bird strike matters. Here come all the information on bird strikes together: Pilot's Reports, Maintenance Reports, bird remains, repair cost information, etc. One copy of the Pilot's Report is filed and the remaining 3 are stored until the end of the year and then sent all together to the Ornithological Station at Sempach for scientifique and statistical evaluation.

Sempach keeps 1 copy of each report on the files and sends the remaining 2 copies to the Federal Air Office for distribution to the airport management concerned and to the Aviation Administration of the state concerned.

So far the way that the Pilot's Form take! This seems

all rather complicated if put into words, but is in fact very simple in its application. How effective it is, we shall discuss later on.

2.2 The second source of information on bird strikes is the Maintenance Report, as I call it here for convenience. This form is filled in by the maintenance people whenever a damage to the aircraft through bird strike is located and no entry in the Aircraft Technical Log was made by the flight crew. The Maintenance Report is also filled in whenever bird remains are found on the aircraft or in the engines intake. Bird remains and the Maintenance Report are also forwarded to the Maintenance Engineering Manager's Office. Here, the lower part of the form - which is a detachable tag - is sent immediately, together with the bird remains and the corresponding Pilot's Report (if filed), to the Ornithological Station at Sempach for identification. The Maintenance Report states - among other information - the estimated cost of repair.

2.3 The third source of information is the Aircraft Technical Log. All entries in the Aircraft Log (for all aircraft types except the DC-9) are being stored in our computerized Maintenance Control System (MCS).

Bird strike items are especially codified, which makes it possible to get separate coputer print-outs of bird strike information whenever needed.

Thatmuch to the reporting system in Swissair.

Comment

Finally I would like to make a few remarks on the evaluation and some comment on the system in general.

3.1 The evaluation within Swissair is ending up in a statistical report - once per year - giving the total of strikes for each aircraft type as taken out of the computer and compared with the number of Pilot's Reports. This shows that as an average 25 + 35% of all bird strikes are not reported by pilots.

3.2 Furthermore the direct costs for repair are determined. Related costs as for crew- and aircraft changes, passenger accommodation or revenue losses, etc. are not recorded.

3.3 The complete evaluation of all data as collected by means of Pilot's- and Maintenance Reports is done at the Ornithological Station at Sempach. The result is presented in the yearly "Civil Aircraft Bird Strike Analysis for Switzerland" and is forwarded to the BSCE.

3.4 Only for approximately 1/3 of the registered bird strikes the bird has been identified - either by bird remains or by visual identification through the pilot in the moment of impact.

This is one of the discourageing facts we have to face. Though it is possible to stimulate the pilot's effort towards filing of bird strike reports, e.g. through informative publications and a monthly review of reportable incidents - including bird strike accidents - it seems unrealistic to expect far better results.

The main reason for this could be the following: the only situation where the pilot can eventually see what kind of bird might become a hazard to his aircraft, is on the ground, i.e. before take-off and during the take-off roll.

Once in the air and close to the ground, in other words, in the height bracket where bird strikes are likely to occur, the identification of birds bcomes difficult unless they are real big ones or a whole flock. Furthermore this is the time when the crew is most busy with instrument reading and cockpit procedures - after take-off and before landing. Therefore a great number of bird

strikes are just heard but not seen or even noticed. This could not only explain the small number of identified birds, but also the difference of about 30% between actual and reported strikes.

3.5 One remark on the use of landing- and taxi lights for all take-offs and landings: With the revision of our Pilot's Report form at the end of 1976, the switching on of landing- and taxi lights for take-off and landing - even in daylight conditions - was introduced as a standing procedure. There is no statistical evidence as yet, that the number of bird strikes can be reduced by this means.

3.6 And this brings me to the last and concluding remark: The r e d u c t i o n of bird strikes is the objective of this honourable assembly; it has always been and it must always be. The accumulation of evidence and data through whatever system is certainly valuable and necessary to cover the grounds for a scientifique and successful approach to the problem. Pilots and airlines however, would highly appreciate - for safety and economical reasons - if the BSCE could set a high priority on scaring and expelling methods and devices, even if this seems fighting the symptoms rather than the cause. But as it is, this looks like being the only way that could lead to results in the foreseeable future.

****

Discussion on WP 6

Pierre: How do you identify "near misses"?

Schwarzenbach: If you can see birds near the aircraft.

Bruderer: Near misses are reported but they are not included into the statistics.

After this there was a question from the delegation of the Netherlands about the type of form for birdstrike reports used by Swissair.

Schwarzenbach: Swissair has in co-operation with the ornithological station of Sempach prepared its own birdstrike report form. We prefer in Swissair to have our own form.

Ferry: We are very grateful for the first paper presented at a BSCE-conference by a respresentative for an airline who is also a pilot. I have the opinion that Swissair has one of the best systems for reporting of bird strikes. -I wonder a little about the number of 30 % for the discrepancy between the reported and the real number of birdstrikes. This will, however, be highlighted by working paper No 31.

ADF616116

BIRD STRIKE COMMITTEE EUROPE

Berne, 29 May - 2 June 1978

Ref: BSCE/13 WP 7

BIRD STRIKES DURING 1976 TO EUROPEAN REGISTERED CIVIL AIRCRAFT (Aircraft over 5700 kg Maximum Weight)

J Thorpe - UK
J G van Dusseldorp - Netherlands

Summary

The strikes, reported throughout the World in 1976 by operators from ten European countries have been analysed. The analysis includes rates for countries' aircraft types and aerodromes based on aircraft movements. Italso covers bird species, part of aircraft struck, effect of strike, cost and airlines affected.

The strike rate in 1976 was significantly greater than in previous years. Gulls (Larus spp.) were involved in nearly half the incidents. The major effect was the crash of an executive jet aircraft, and damage to 57 engines. During the year bird strikes were estimated to have cost European airlines at least 3.7 million US dollars in engineering repairs.

CONTENTS

85

1. INTRODUCTION

1.1 Prior to 1972 reports containing data on bird strikes were produced by different organisations, such as airlines, aviation authorities and ornithologists. The information was presented in various forms, using different guidelines. These reports seldom contained data on aircraft movements, such that the most useful form of comparison, strike rate, could be determined.

1.2 In order that a common basis for the analysis of bird strike data could be agreed, a Working Group of the Bird Strike Committee Europe was formed in 1972, led by the representative from the United Kingdom Civil Aviation Authority Airworthiness Division at Redhill. After consultation with other member countries sets of Analysis Tables with Explanatory Notes were circulated to all members of the BSCE, together with a request that each country produce an analysis on their bird strikes. These analyses were consolidated to form an annual report on Bird Strikes to European Registered Civil Aircraft, and reports covering the individual years 1972, 1973 and 1974 and 1975 have been presented to annual BSCE meetings. This paper presents the 1976 analysis.

1.3 Appendix 1 contains the Tables of data relating to this paper.

1.4 Appendix 2 provides brief details of serious world-wide bird strike incidents.

2. SCOPE

For the following reasons, the detailed analysis includes only civil aircraft of over 5700 kg (12 500 lb) maximum weight, except that all executive jets including those of weight less than 5700 kg have been included:

(a) the airworthiness requirements relating to bird strikes are different for the smaller class of aeroplanes,

(b) much more is known about the reporting standards of operators of transport types, and their movement data is more readily available than that for air taxi or private owner aircraft,

(c) aircraft of less than 5700 kg are in general, much slower with a different mode of operation, requiring less airspace, and a noticeably different strike rate would be expected.

3. DISCUSSION

3.1 ANNUAL RATE/COUNTRY (See Table 1)

(a) Information has been obtained from a total of 10 European countries. A few of these were not able to provide full information, and their data, therefore, appears in some tables and not in others.

86

(b) The overall strike rate for the 1428 incidents contained in this analysis is 5.2 per 10,000 movements (two movements per flight). This is considerably higher than the average of 3.5 during the past four years.

(c) The strike rate reported by each country is dependent upon two major factors -

- reporting standard

- the bird strike problem at airports within that country, since, although each country is reporting world-wide strikes, a high proportion of its aircraft movements are within its own borders.

(d) The country with the worst strike rate is the Netherlands with 12.1 per 10,000 movements, followed by Germany with 11.2. France has consistently reported a rate well below average at 1.3, however this is thought to be a reporting problem. The reasons for the differences between countries is not clear, but it is almost certainly a combination of the above two factors.

3.2 AIRCRAFT TYPES (See Table 2)

(a) General

It may be that aircraft types which appear to be similar to humans are not similar to birds, and there are other factors, such as noise patterns, size and use of lights, which affect the strike rate. The continued long term collection of statistics will provide fuller information.

(b) Jet Aeroplanes

(i) There appears to be no consistent correlation, possibly for the reasons suggested above. The results obtained this year, in general, show close similarity between aircraft of similar design eg DC8 and B707, Trident and B727, BAC 1-11 and DC9. This was not so in the previous paper based on four years data.

(ii) The group of wide-bodied aircraft comprising B747, L1011 Tristar, DC10 and A300B Airbus, has a much above average rate of 8.3, whereas the four executive jets, with a comparatively low total of movements have a slightly below average rate of 4.3. The group comprising the rest of the jets has a rate of 5.2.

(c) Turboprop Aeroplanes

The extent to which turboprop aeroplanes are used has declined considerably, and the average strike rate for all turboprops is considerably less than that for jets. This could be expected as a result of the lower take-off and landing speeds.

(d) Piston Aeroplanes

Very few strikes were recorded to piston engined aeroplanes, except for the Convair 440, for which movement data is not available.

(e) Helicopters

The number of strikes reported to helicopters is very low, only 5. Because helicopters fly mainly at low altitude where birds are most frequently found, they are continuously exposed to the risk of a strike. Therefore flying hours have been used to determine a strike rate. The rate is very low at 0.6 per 10,000 hours, possibly due to their modest operating speed.

3.3 AERODROMES (See Table 3)

(a) The aerodrome data is of particular importance as it may indicate where bird control measures need to be taken. Some countries were able to provide aerodrome movement data for their nationally registered aircraft, so that a national rate could be quoted.

However the total number of strikes at each aerodrome, reported by all European sources has been included.

(b) Aerodromes which have a high number of strikes or a high strike rate may be influenced by some of the following:

(i) a very good standard of reporting

(ii) a large bird population (perhaps due to the airport's geographical location)

(iii) a large number of aircraft movements

(iv) inadequate bird control measures

(v) a local problem which may be beyond the control of the aerodrome, eg a garbage dump in the vicinity of the aerodrome.

(c) Of the aerodromes with more than 10,000 movements and where the rate is known, Bremen, Hamburg, Cologne, Luton, Belfast and Glasgow have much above average rates.

(d) The aerodromes with high numbers of strikes are Copenhagen-Kastrup, Frankfurt, Amsterdam and London-Heathrow. However several of these airports are known to have a high number of aircraft movements and a difficult bird problem but, through effective use of bird control measures, have managed to maintain a commendably low strike rate. This demonstrates what can be achieved.

(e) Significant numbers of strikes have been reported at some aerodromes outside the boundaries of the ten reporting countries. New York, Kennedy Airport has 9, but is frequently used by many European airlines. However the numbers at Athens and Nairobi (6 each) and Madrid and Bombay (5 each) appear to be rather high considering the relatively few European operators' movements at these airports.

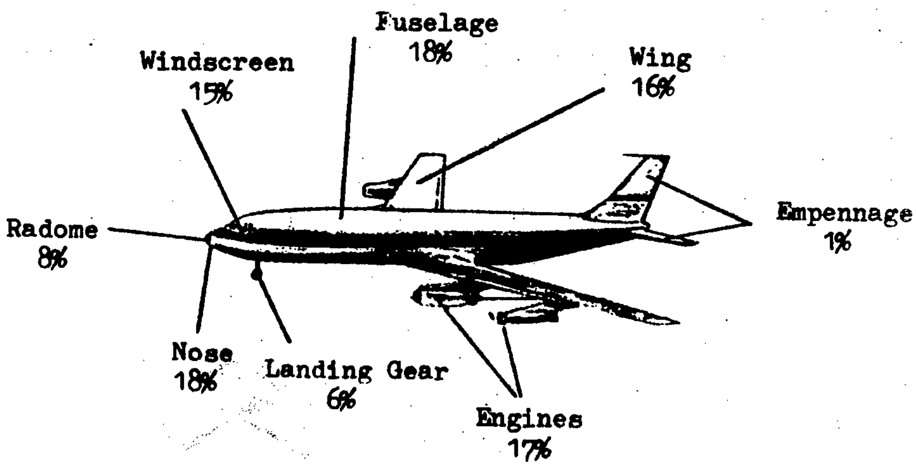
(f) There were 54 incidents where the aircraft was considered to be en-route.

3.4 BIRD SPECIES (See Table 4)

The bird species involved were identified in 684 incidents. The identification standard ranged from examination of bird remains by a trained ornithologist, to the fleeting glance of a pilot. From Figure 2 it can be seen that overall 44% of strikes involved gulls (Larus sp), of which the black-headed gull (Larus ridibundus) and Common gull (Larus canus) were the most frequently identified. Next on the list were Lapwings (Vanellus vanellus) with 13.9%, followed by the combination of swifts, swallows and martins with 11% and pigeons (Columba sp) with 7%. The percentage of gull strikes was 10% lower than in the previous 4 year period, but lapwing strikes were 2% higher. Less than 1% of incidents were known to involve birds of greater than 1.81 kg (4 lb).

3.5 PART OF AIRCRAFT STRUCK (See Table 5)

(a) From Figure 7 it can be seen that the parts most frequently reported as being struck were the nose and fuselage with 18% each, followed by the engines with 17%. The windscreen was struck in 15% of the incidents. It should be noted that there were 17 incidents where more than one engine was struck, of which seven struck all engines.



3.6 EFFECTS OF STRIKES (See Table 6)

(a) During the period covered by this paper a European registered executive jet aircraft crashed due to both engines ingesting gulls on take-off, without injury to the two occupants.

(b) 57 engines were damaged such as to require repair or replacement. Of these 28 were on twin-engined aircraft. It appears that 22% of engine strikes involve engine damage.

(c) Only 2 windscreens were changes, a small number when compared with 222 windscreen strikes (1%). It is thought that none of these incidents involved penetration of the windscreen.

(d) There were 13 cases of radome damage, out of 116 radome strikes, a rather high percentage (11%). In most cases the radome was only delaminated, but in a few cases it was shattered. The radome strength is usually determined by the dielectric properties necessary for satisfactory operation of the weather radar.

3.7 EFFECT VERSUS AIRSPEED VERSUS WEIGHT OF BIRD (See Table 7)

The number of incidents where damage is caused, and the airspeed and bird weight are known, are comparatively few. However it appears that the greatest risk of damage lies in the 101-150 knot speed range, from birds of weight up to 1.8 kg (4 lb).

3.8 COST (See Table 8)

Much more information on costs has been provided this year by seven countries, the engineering cost of bird strikes totalling 2,800,000 US dollars. From this it is estimated that the cost to all European operators is at least 3.7 million US dollars. The accident to the Italian Lear Jet is not included in this total.

3.9 WEATHER AND TIME OF DAY (See Table 9)

(a) It can be seen that 26.1% of strikes were at night, when aircraft movements are low. In addition 13.4% were during the comparatively short periods of twilight.

(b) The data about weather is as yet limited, and in any case the pattern of weather, irrespective of strikes, is not easily quantified. However it can be seen that very few strikes are associated with mist, fog and precipitation.

3.10 AIRCRAFT OPERATORS (See Table 10)

This table provides a guide to the reporting rates of individual airlines. It is probable that it is considerably affected by the airport(s) at which the airline has its main base.

4. CONCLUSIONS

4.1 The overall rate for the 1428 strikes reported during this period by European operators is 5.2 strikes per 10,000 movements. This rate is considerably higher than the average of 3.2 for the previous four years. The Netherlands and Germany have the highest rates, possibly due to a good standard of reporting.

4.2 There does not appear, from the available data, to be any close correlation between the strike rate and the aeroplane type, in terms of speed, engine type, etc. However the strike rate for the group comprising wide-bodied aeroplanes does appear to be above average, indicating that frontal area may have an effect. There is no evidence that the strike rate of executive jet aeroplanes is above that which would be expected for their size.

4.3 Certain of the airports where movement data was available have an above average strike rate. There are also some airports outside Europe where the number of bird strikes reported by European operators is high, but the movements by European registered aircraft are low.

4.4 Gulls (Larus sp) were struck more frequently than other birds, being involved in 44% of incidents. Less than 1% of strikes were known to involve birds of greater than 1.8 kg (4 lb).

4.5 Although the majority of strikes occurred during daylight, 26% were at night when the number of aircraft movements was lower.

4.6 The nose section and fuselage were each struck in 18% of the incidents, followed by engines with 17%. Approximately 1% of all strikes involved more than one engine.

4.7 Apart from the crash of one aircraft, due to ingestion in both engines, the major effect was damage to 57 engines, approximately 1 in 5 of the engine strikes. There were also 13 cases of radome damage, approximately 1 in 9 radome strikes.

4.8 Based on information provided by seven countries the estimated minimum cost of bird strikes to European airlines was at least 3.7 million US dollars in the year.

BIRD STRIKE ANALYSIS

EUROPEAN OPERATORS 1976

CIVIL AIRCRAFT OVER 5700 kg (12 500 lb) MAXIMUM WEIGHT

Notes: 0.1 The following are excluded from this Analysis:

(a) aircraft of maximum weight 5700 kg (12 500 lb) and under, except for executive jets, which have been included;

(b) all military type and operated aircraft.

0.2 All Tables are for strikes reported world-wide.

0.3 The Total columns of many of the Tables are different, as some countries have not been able to provide full information for every table.

Table 1 Country 1976

Country	Number of Incidents	Number of Movements	Rate per 10,000 Movements
Austria	6	54,000	1.1
Belgium	40	119,717	3.3
Denmark	58	172,832	3.4
France	75 (3)	569,341	1.3
Germany	447	399,780	11.2
Italy	23 (2)	212,200	1.1
Netherlands	150	123,714	12.1
Sweden	(68)	-	-
Switzerland	119	182,104	6.5
United Kingdom	510 (3)	900,994	5.7
Total	1,428 (76)	2,734,682	5.2

Notes:

1.1 There are two movements per flight.

1.2 Movement data for Italy and Austria is based on ICAO sources.

1.3 Austria reported damaging strikes only.

1.4 Helicopters are excluded from this table.

1.5 Data from Switzerland is for Swissair only.

1.6 The figures in brackets are strikes for which no movement data is available.

Table 2 Aircraft Type - 1976

Type	Aircraft	Number of Countries Reporting	Number of Incidents	Number of Movements	Rate per 10,000 Movements
JET					
4 engined	McDonnell Douglas DC8	6	71 (4)	112,315	6.3
	Boeing 707/720	6	116	186,976	6.20
	Boeing 747	8	44	82,183	5.3
	BAC VC10	1	12	27,916	4.30
	Concorde	2	1	2,536	3.9 *
	HS Comet 4	1	2	18,262	1.10
3 engined	McDonnell Douglas DC10	8	92	74,003	12.4
	HS Trident	1	104	135,558	7.7
	Boeing 727	4	163 (1)	233,564	7.0
	Lockheed 1011 Tristar	2	11	17,246	6.4
2 engined	Cessna 500 Citation	1	1	1,036	9.6 *
	Boeing 737	4	211	265,582	7.9
	A300B Airbus	4	24	31,314	7.7
	Lear Jet	4	3	4,408	6.8 *
	BAC 1-11	2	110	241,336	4.6
	HS 125	3	14	30,914	4.5
	McDonnell Douglas DC9	5	189 (35)	452,703	4.2
	DA01 Mercure	1	14	40,954	3.4
	Fokker F28 Fellowship	2	2 (3)	7,622	2.6 *
	Falcon 20	3	2	10,538	1.9
	SE210 Caravelle	6	36	230,690	1.6
	VFW 614	3	1	8,366	1.2 *
TURBOPROP					
4 engined	Canadair CL44	1	8	9,488	8.4
	BAC Merchantman	1	11	13,084	8.4
	BAC Viscount	1	78 (2)	120,042	6.50
	BAC Britannia 253	2	1	4,180	2.4 *
	HS Argosy	1	1	5,460	1.8 *
2 engined	HS 748	1	19	34,718	5.5
	HP Herald	1	17	64,168	2.6
	Fokker F27	5	23	126,316	1.8
	Nord 262	2	2	51,069	0.4
	DHC6 Twin Otter	2	1	25,000	0.4
	Beech 99	1	1	30,000	0.3

Continued overleaf

Table 2 (Continued)

Type	Aircraft	Number of Countries Reporting	Number of Incidents	Number of Movements	Rate per 10,000 Movements
PISTON					
	DH114 Heron ATL 98 Carvair Douglas DC6 Convair 440 Douglas DC3 Dakota	1 1 2 2 1	3 1 0 0 (23) 0	2,558 6,784 1,982 8,865 14,946	11.7 * 1.5 * 0 * 0 * 0
UNKNOWN			39	-	-
HELICOPTERS					
	Sikorsky S61 Others	1 2	4 1	39,688 46,120	1.0 -
TOTAL			1,433	-	-

Table 2A Summary of Aeroplane Types

	Number of Incidents	Number of Movements	Rates per 10,000 Movements
Jet Turboprop Piston Unknown	1,223 (43) 162 (2) 4 (23) 39	2,216,022 483,525 35,135	5.5 3.3 1.1
TOTAL	1,428 (68)	2,734,682	5.2

Notes: 2.1 There are two movements per flight.

*2.2 Rates for aircraft types with less than 10,000 movements are included in the Table, but are subject to greater error.

2.3 Rates for types where ICAO data has been used are only approximate (ICAO data on Charter Operators is not comprehensive).

2.4 The figures in brackets are from Sweden, which was unable to supply movement data.

Table 3 Aerodromes - 1976

Aerodrome/Country	Incidents	Movements	Rate per 10,000 Movements	Incidents to other European Aircraft	Total Incidents
EUROPEAN AERODROMES					
Austria					
Vienna	1			8	9
Linz	1				1
Graz	1				1
Belgium					
Brussels	25	57,471	4.35	11	36
Antwerp	3	5,726	5.24 *		3
Charleroi	1	2,130	4.69 *		1
Denmark					
Copenhagen	35	150,630	2.32	22	57
Rønne	4	3,458	11.57 *	4	8
Billund	4	8,355	4.79		4
Aalborg	3	6,643	4.52 *		3
Esbjerg	3	5,062	5.93 *		3
Karup	1	3,006	3.33 *		1
Odense	2	3,368	5.94 *		2
Sønderborg	1	3,708	2.70 *		1
Thisted	2	1,417	14.11 *		2
Thirstrup	1	4,992	2.00 *		1
Vagar	1	1,299	7.70 *		1
France					
Paris-Orly	17	144,732	1.17	11	28
Paris-Charles de Gaulle	7	92,879	0.75	7	14
Paris Le Bourget	4	38,116	1.05	7	11
Lyon-Satolas	9	93,456	2.07		9
Nice	7	41,289	1.69	2	9
Marseille Marignane	4	46,688	0.86		4
Tarbes Ossun Lourdes	3	4,272	7.02 *		3
Bastia Poreta	2	8,853	2.26 *		2
Biarritz Bayonne	2	3,164	6.32 *		2
Montpellier	2	6,423	3.11 *		2
Metz Frescaty	2	5,189	3.86 *		2
Germany					
Frankfurt	66	-	6.87	5	71
Hamburg	40	-	12.03	3	43
Dusseldorf	35	-	9.38	5	40
Munich	36	-	8.28	4	40
Cologne	20	-	11.5	3	23
Bremen	10	-	19.97	4	14
Berlin Tegel	-	-	-	9	9
Hanover	8	-	3.65	1	9
Nuremburg	8	-	11.39		8
Westerland	-	-	-	3	3
Stuttgart	2	-	1.17	1	3

Continued overleaf

Table 3 (Continued)

Aerodrome/Country	Incidents	Movements	Rate per 10,000 Movements	Incidents to other European Aircract	Total Incident
Italy					
Rome Fuimicino	8			5	13
Venice	4				4
Milan Linate	4				4
Naples	2			2	4
Trieste	2				2
Alghero	-			2	2
Rome Ciampino	1				1
Bari	1				1
Milan Malpensa	1				1
Catania	1				1
Caglia	1				1
Netherlands					
Amsterdam	44	61,401	7.17	19	63
Rotterdam	4	3,267 *	12.24	2	6
Eindhoven	1				1
Sweden					
Stockholm Arlanda	8	66,100	1.2	4	12
Norrkoping	9	4,400 *	20.5		9
Stockholm Bromma	8	30,400	2.6		8
Gothenburg/Torslanda	5	29,900	1.7	3	8
Halmstad	3	4,300 *	7.0		3
Angelholm	3	3,700 *	8.1		3
Malmo/Sturup	3	15,900	1.9		3
Jonkoping	2	7,400 *	2.7		2
Visby	2	7,900 *	2.5		2
Switzerland					
Zurich	34	53,886	6.3	6	42
Geneva	15	31,769	4.7	8	23
Basle	10	31,385	3.2		10
United Kingdom					
London Heathrow	48	131,239	3.7	19	67
Glasgow	35	32,489	10.8		35
Luton	33	17,474	18.9	1	34
Belfast (Aldergrove)	33	20,387	16.2		33
Prestwick	27	29,832	9.0		27
Edinburgh	21	22,469	9.3		21
London Gatwick	20	68,877	2.9		20
Birmingham	13	20,539	6.3		13
Aberdeen	13	45,981	2.8		13
Ronaldsway I of M	10	12,894	7.7		10
East Midlands	9	15,576	5.8		9

Continued overleaf

Table 3 (Continued)

Aerodrome/Country	Incidents	Movements	Rate per 10,000 Movements	Incidents to other European Aircraft	Total Incidents
United Kingdom (Contd.)					
Newcastle	9	15,818	5.7		9
Manchester	9	36,491	2.5		9
Glamorgan/Rhoose	8	6,770	11.8		8
Liverpool	6	11,162	5.4		6
Tees-side	4	8,334	4.8		4
Belfast Harbour	4				4
Bristol Filton	4				4
Inverness	3	10,493	2.8		3
Southampton	3	10,367	2.8		3
Macrihanish	3				3
Stansted	2				2
Hatfield	2				2
Leeds/Bradford	2				2
Warton	2				2

Table 3 (Continued)

OTHER AERODROMES

List of aerodromes where more than one strike has been reported by European operators.

Guernsey	(UK)	9	Freetown	(Sierra Leone)	3
New York	(US)	9	Merida	(Mexico)	3
Nairobi	(Kenya)	6	Entebbe	(Uganda)	3
Athens	(Greece)	6	Kinshasa	(Zaire)	2
Bombay	(India)	5	Oujda	(Morocco)	2
Madrid	(Spain)	5	Istanbul	(Turkey)	2
Monrovia	(Liberia)	4	Mailand		2
Jersey	(UK)	4	Palma	(Spain)	2
Freeport	(Bahamas)	4	Addis Abbaba	(Ethiopia)	2
Lisbon	(Portugal)	4	Gibraltar	(Gibraltar)	2
Tenerife	(Canary Isles)	4	Alghero	(Italy)	2
Lima	(Peru)	4	Accra	(Ghana)	2
Bangkok	(Thailand)	4	Fornebu	(Norway)	2
N'Djamena	(Tchad)	3	New Dehli	(India)	2
Dakar	(Senegal)	3	Los Angeles	(US)	2
Douala	(Cameroon)	3	La Paz	(Bolivia)	2
Abidjan	(Ivory Coast)	3	Roswell	(US)	2
Boston	(US)	3	Santiago	(Chile)	2
Lagos	(Nigeria)	3	Malaga	(Spain)	2
Hong Kong	(Hong Kong)	3	Prague	(Czechoslovakia)	2
Barcelona	(Spain)	3	Toronto	(Canada)	2
Bergen	(Norway)	3	Panama	(Panama)	2

Other Aerodromes with single incidents	88
En-Route	54
Unknown	96
TOTAL	1,504

Notes: * 3.1 Rates with less than 10,000 movements are included, but are subject to greater error.

Table 4 Bird Species - 1976

English Name	Scientific Name	Weight	Weight Category	Number of Incidents	% Based on 688
Ciconiiformes					
Stork	Ciconiidae	up to 3 kg	C	2	0.3
Heron	Ardea sp.	up to 1.8 kg	B	3	0.4
Anseriformes					
Mallard	Anas Platyrhynchos	900 g	B	2	0.3
Duck	Anas sp.	300-1.5 kg	B	1	-
Goose	Anser sp.	up to 2.5 kg	C	1	-
Falconiformes					
Kite	Milvus sp.	1	B	5	0.7
Black Kite	Milvus migrans	1 kg	B	2	0.3
Vulture		up to 5 kg	C	1	-
Sparrowhawk	Accipter Aisus	200 g	B	1	-
Falcon	Falco sp.	up to 800 g	B	19	2.8
Common buzzard	Buteo buteo	880 g	B	6	0.9
Kestrel	Falco tinnunculus	200 g	B	5	0.7
Buzzard	Buteo sp.	up to 880 g	B	14	2.0
Hen harrier	Circus cyaneus	400 g	B	1	-
Montagues harrier	Circus pygargus	300 g	B	4	0.6
Galliformes					
Partridge	Perdix perdix	300-400 g	B	16	2.3
Pheasant	Phaslanus Colchicus	1.2 kg	B	6	0.9
Charadriiformes					
Oyster catcher	Haematopus ostralegus	550 g	B	8	1.2
Lapwing	Vanellus vanellus	250 g	B	95	13.8
Golden Plover	Pluvialis apricaria	200 g	B	2	0.3
Curlew	Numenius arquata	800 g	B	1	-
Greenshank	Tringa nebularia	160 g	B	1	-

Continued overleaf

Table 4 (Continued)

English Name	Scientific Name	Weight	Weight Category	Number of Incidents	% Based on 688
Charadriiformes Contd.					
Great black-backed gull	Larus marinus	1.8 kg	B	6	0.9
Lesser black-backed gull	Larus fuscus	800 g	B	6	0.9
Herring gull	Larus argentatus	1.1 kg	B	21	3.1
Common gull	Larus canus	400 g	B	5	0.7
Black-headed gull	Larus ridibundus	300 g	B	49	7.2
Gull	Larus sp.	300-1.8 kg	B	214	31.1
		Total	Gulls	301	43.7
Columbiformes					
Pigeon	Columba sp.	450 g	B	48	7.0
Strigiformes					
Owl	-	170-380 g	B	3	0.4
Long-eared owl	Asio otus	260	B	4	0.6
Short-eared owl	Asio flammeus	380 g	B	1	-
Apodiformes					
Swift	Apus apus	30 g	A	13	1.9
Passeriformes					
Sky lark	Alauda arvensis	40 g	A	3	0.4
Swallow	Hirundo rustica	15 g	A	62	9.1
House martin	Delichon urbica	15 g	A	1	-
Carrion crow	Corvus corone	550 g	B	11	1.6
Jackdaw	Corvus monedula	230 g	B	2	0.3
Raven	Corvus corax	1.2 kg	B	1	-
Rook	Corvus frugilegus	400-550 g	B	1	-

Continued overleaf

Table 4 (Continued)

English Name	Scientific Name	Weight	Weight Category	Number of Incidents	% Based on 688
Passeriformes Contd.					
Magpie	Pica pica	220 g	B	1	-
Redwing	Turdus iliacus	85 g	A	3	0.4
Starling	Sturnus vulgaris	85 g	A	13	1.9
Green finch	Carduelis chloris	30 g	A	1	-
Sparrow	Small passeriform	18-40 g	A	22	3.2
Corn bunting	Plectrophenax nivalis	25 g	A	1	-
Unknown				813	
TOTAL				1,501	

Notes: 4.1 Bird weights and Scientific Names are based on information supplied by Pest Infestation Control Laboratory, MAFF, Worplesdon, England, and the average weight has been assumed.

4.2 The bird Categories based on current Civil Airworthiness requirements are:

- A below 110 g ($\frac{1}{4}$ lb)
- B 110 g to 1.81 kg ($\frac{1}{4}$ lb to 4 lb)
- C over 1.81 kg to 3.63 kg (4 lb to 8 lb)
- D over 3.63 kg (8 lb)

4.3 Those birds not positively identified are tabled as Unknown, except where there is evidence that they are Large (C or D).

4.4 Percentages are based on incidents where birds are identified.

Table 5 Part of Aircraft Struck - 1976

Part Struck	No. of Strikes by Bird Weight Category					% Based on 1488
	Unknown	A	B	C & D	Total	
Fuselage	150	29	97	-	276	18.5
Nose (excluding radome and windscreen)	154	27	91	1	273	18.3
Radome	58	14	44	-	116	7.8
Windscreen	114	44	64	-	222	14.9
Engine:-						
1 engine struck	124	9	104	1	238	16.0
2 out of 3 struck	1	-	1	-	2	0.1
2 or more of 4 struck	1	-	7	-	8	0.5
all engines struck	-	1	6	-	7	0.5
Wing/Rotor	108	16	117	-	241	16.2
Landing Gear	34	9	46	1	90	6.0
Empennage	3	1	11	-	15	1.0
Part Unknown	79	14	116	-	209	-
TOTAL	826	164	704	3	1,697	100.0%

Notes: 5.1 The totals in Table 5 are higher than others, as one bird can strike several parts.

5.2 The percentages are based on incidents where the part struck is known.

5.3 Where both landing gear, or both wings are struck, two incidents are recorded.

Table 6 Effect of Strike - 1976

Effect	No. of Strikes by Bird Weight Category						% Based on 536
	Unknown	A	B	C	D	Total	
Loss of Life/ Aircraft	-	-	1	-	-	1	-
Flight Crew Injured	-	-	-	-	-	-	-
Engine Damage Requiring Repair							
2 Engined Aircraft	9	-	20	-	-	29	5.4
Others	18	-	10	-	-	28	5.2
Windscreen Cracked or Broken	-	-	2	-	-	2	0.4
Radome Changed	2	-	11	-	-	13	2.4
Deformed Structure	2	1	4	-	-	7	1.3
Skin Torn/Light Glass Broken	10	1	10	-	-	21	3.9
Skin Dented	11	2	32	1	-	46	8.6
Propeller/Rotor/ Transmission Damaged	-	1	2	-	-	3	0.6
Aircraft System Lost	5	1	5	-	-	11	2.0
Nil Damage	187	62	126	-	-	375	
Unknown	59	1	20	-	-	80	-
TOTAL	303	69	243	1	-	616	100%

Notes: 6.1 If, for example, skin is torn in two places, or both windscreens are broken, two incidents are recorded.

6.2 The percentages are based on known effects.

Table 7 Effect-Airspeed-Weight of Bird-1976 Data

Effect / Airspeed / Weight	0-80		81-100		101-150		151-200		201-250		over 250	
	A&B	C&D	A&B	C&D	A&B	C&D	A&B	C&D	A&B	C&D	A&B	C&D
Loss of Life/Aircraft												
Flight Crew Injured												
Engine Prematurely Changed			2		13		2					
Windscreen Cracked/ Broken					2							
Radome Changed							1					
Deformed Structure					5	1						
Skin Torn/Light Glass Broken					2		2			1		
Skin Dented			2		10	1	1				1	
Propellor/Rotor Damaged												
Aircraft System Lost			1		1							
Total			5		33	2	6			1	1	

Notes: 7.1 The totals are very low as the table includes only damaging strikes where bird weight and airspeed are known.

7.2 Airspeed is in **knots**.

Table 8 Cost-1976

	Aircraft Movements	Cost US Dollars
Where cost is known	2,068,702	2.80 million
Where cost is not known	665,980	
LIKELY TOTAL COST	2,734,682	3.70 million

Notes: 8.1 Engineering costs only.

8.2 Cost data supplied by Belgium, Denmark, France, Netherlands, Sweden, Switzerland and the UK.

Table 9 Weather-Strikes On or Near Aerodrome and Time of Day

Weather Condition / Time of Day	Dawn		Day		Dusk		Night	
Precepitation	2		3		1		5	
Mist / Fog *	1		1				2	
Cloud Coverage	< ½	> ½	< ½	> ½	< ½	> ½	< ½	> ½
Base Below 1000 ft		1	2	9		1		2
Base 1000-5000 ft		3	7	6	1	4	2	8
Above 5000 ft			4	6				
Clear	4		57		3		22	
Total in Each Time Band	11		95		10		41	
% In Each Time Band	7.0		60.5		6.4		26.1	

Notes: 9.1 Visibility less than 1000 metres.

9.2 Clear includes CAVOK.

Table 10 Aircraft Operator's Reported Strikes

Operator	Number of Incidents	Number of Movements	Rate per 10,000 Movements
Austria			
Austrian Airlines	6	54,000 +	1.1
Belgium			
Sabena	37	87,102	4.2
Trans European Airways	2	5,462	3.7 *
Young Cargo	1	2,302	4.3 *
Denmark			
SAS	26	89,896	2.9
Sterling Airways	11	36,074	3.0
Maersk Air	8	21,738	3.7
Conair	8	6,884	11.6 *
Cimber Air	1	17,888	0.6
Others	4	2,440	16.4 *
France			
Air Inter	36	144,344	2.5
Air France	19	339,014	0.5
UTA	15	29,276	5.1
Air Alpes	2	65,000 +	0.3
Uni Air	1	13,000 +	0.8
Others	5	-	-
Germany			
Various	449	-	-
Italy			
Alitalia	22	-	-
Others	3	-	-
Netherlands			
KLM/NLM/Martinair	139	117,990	11.8
Transavia	11	5,724	19.2 *
Sweden			
SAS	39	-	-
Linjeflyg AB	26	-	-
Others	3	-	-
Switzerland			
Swissair	119	182,104	6.5

Continued overleaf

Table 10 (Continued)

Operator	Number of Incidents	Number of Movements	Rate per 10,000 Movements
UK			
Transmeridian	5	5,520	9.1 *
Tradewinds	3	3,690	8.1 *
Laker	12	17,100	7.0
British Airways			
Overseas Division	46	67,600	6.8
Remainder	254	357,400	7.1
British Caledonian	44	77,500	5.7
British Midland	21	41,700	5.0
McAlpine	3	6,200	4.8 *
Britannia Airways	18	40,400	4.5
Alidair	4	9,800	4.1
Monarch	5	14,100	3.5
British Island Airways	13	46,800	2.8
Air Anglia	6	27,000	2.2
Dan-Air	17	86,200	2.0
British Air Ferries	2	16,600	1.2
Others/Unknown	65	-	-

Notes: 10.1 The aircraft movements of operators who did not report any strikes are not included.

10.2 Leased aircraft are included against the operator.

+10.3 Estimated movements.

*10.4 Rate subject to error.

SERIOUS BIRD STRIKE INCIDENTS WORLD-WIDE 1976

(Executive Jets and Aircraft over 5,700 Kg)

1.1.76 SAS DC10-30, LN-RKA, at Copenhagen

During a night take-off with 13 on board from runway 22L when aircraft was at 100 ft and 175 kts it struck flock of gulls. Pilot heard loud bang and No 1 engine lost power. Aircraft returned safely. A total of 28 black-headed gulls (Larus ridibundus) were found on runway. It is believed that between 9 and 15 birds went through No 1 and 3 engines. The weight of the birds was between 240 and 340 grams. There was severe damage to No 1 engine, including failure of the casing which had started to open up. There was also minor damage to No 3 engine and the left wing. The weather conditions were 7/8 cloud, base 500 ft, slight rain, and due to aerial damage two ILS approaches were made. The cost of repairs are estimated to be approx 1½ million US dollars.
(Source Bird Strike Committee Denmark and ICAO Subsequent Notification)

23.1.76 Pan American Boeing 747 at Istanbul

During take-off birds were ingested into No 3 and 4 engines, aircraft returned but neither engine was shutdown. Birds struck were gulls and "hawks", and a dead bird was found in No 8 canoe fairing. Seven fan blades were replaced on No 3 engine and six on No 4, and there were cuts in cowlings.
(Source Aviation Week, February 2, 1976 - not confirmed by other sources)

6.2.76 Executive Lear 24, I-AMME, Bari, Italy

Just before lift-off aircraft encountered a flock of gulls. Both engines failed and aircraft veeered off the runway and came to rest in a small field. The 2 occupants were uninjured.
(Source - Lloyds List and Sillages)

13 February 1976 Air France B747 at Paris Orly

During the take off run at 165 kts struck flock of black headed gulls (Larus ridibundus). Fifty three tonnes of fuel were jettisoned before landing. It was found that engine 1 was badly damaged, and engine 4 required some new fan blades.
(Source - French Reporting System)

10.3.76 British Airways Boeing 747, G-AWNI, at Prestwick, UK

At approx 110 kts during the take-off on runway 13 aircraft struck flock of birds, engine 4 had high vibration and ran down, and take-off was abandoned. All fan blades were damaged, nose cowl extensively damaged with 2 holes in outer case, fan blade tips missing. The weather was 8/8 cloud at 1,300 ft with rain.

14.4.76 British Airways Boeing 747, G-AWNK, at Prestwick, UK

At 50 ft, 160 kts during take-off on a training flight the aircraft struck a flock of gulls (believed Herring gulls - Larus agentatus or Lesser black backed gulls - Larus fuscus). There was loud bang, power loss, fire warning and tower reported 200 ft long flame and pieces falling. Engine was shutdown and fire bottles fired. Vibration with engine shutdown even at 165 kts. Inspection showed 2 fan blades broken and all other blades damaged, one foot square hole right through nose cowl outer skin. Cowlings displaced, pylon panels and exhaust cone missing, reverser sleeve displaced, leading and trailing edge flaps holed. Weather was 3/8 at 4,000 ft, visibility greater than 10 Km. There were 6 crew on board.
(Source: UK Reporting System)

27 August 1976 British Airways B747 at Hong Kong

At 400ft after take off two large birds seen to go under right wing. Found 13 x 6 inch hole in flap canoe fairing outboard of engine 3. Remains of small hawk (Falconiformes) removed.
(Source - UK Reporting System)

12 November 1976 Private Falcon 20 N27R at Naples, Florida, US

Before the accident airport employees had dispersed a flock of gulls from the runway. Most of the gulls departed but about 30 returned. The radio normally carried by the bird scaring team was unserviceable. By this time (8.55 local, daylight) the aircraft had started its take off run. Shortly after becoming airborne it passed through the flock, both engines failed and the aircraft crashed. The fuselage was severely damaged, a wing separated and all eleven occupants were seriously injured. The gulls were ring-billed gulls (Larus delawarensis).
(Source - ICAO Subsequent Notifications and US Sources)

BSCE/A/2

Revised
June 1976

BIRD STRIKE COMMITTEE EUROPE

MILITARY AIRCRAFT

BIRD STRIKE ANALYSIS

1976

Prepared by: Squadron Leader T S Austin RAF
MOD (Inspectorate of Flight Safety (RAF)) - UK

///

ANALYSIS OF MILITARY BIRDSTRIKES - 1976

INTRODUCTION

1. Data used in this analysis was supplied by the following air forces:

Royal Netherlands Air Force
Royal Norwegian Air Force
Royal Air Force
Swedish Air Force

2. The United States Air Force (Europe) also supplied data and although the information was not suitable for inclusion in the tables, points of interest are included in this analysis.

STRIKE RATES

3. Table 1 shows the strike rates for aircraft by their main role. Strike and Recce aircraft, operating mainly in the low level role showed up, once again, with the highest strike rate. Within nations the strike rate varied quite considerably, probably reflecting the different operating speeds and heights of the different aircraft. In the United Kingdom, for instance, there are 3 aircraft operating in the same speed and height range. Two, the Harrier and Jaguar, operate mainly over the land whilst the third, the Buccaneer, operates largely over the sea. The Buccaneer's strike rate is at least twice that of the other aircraft.

AIRFIELD BIRDSTRIKES

4. Table 2 lists the number of strikes against airfields and, in the case of domestic airfields only, strike rates. The Netherlands, in particular, appear to have a problem with two airfields, Leeuwarden and Twenthe, showing well above the average strike rates. It will be interesting to see what effect bird control teams, which have been formed since 1976, will have on these rates.

5. Excluding the strikes which are listed as "unknown" in table 2, 58% occurred on and around the airfield whilst 42% occurred en route. This is a complete reversal of 1975 when 45% occurred "on airfield" and 55% occurred "en route".

BIRD SPECIES

6. Table 3 shows the bird species involved in strikes. Gulls of all types featured in 40% of occasions when the bird was identified against 30% in 1975 whilst the second most common type of bird struck, the Lapwing (Vanellus vanellus) again featured in 15% of occasions. However, of the total number of recorded birdstrikes (665) only in 39% of occasions was the bird identified.

PARTS OF THE AIRCRAFT STRUCK AND THE EFFECT

7. Tables 4, 4A and 5 show the parts of the aircraft struck, the effect of the strike and the effect against airspeed and weight of the bird. The distribution of strikes about the aircraft remains substantially the same as that for 1975. The effect of the strikes also follows the same pattern for 1975 with 58% causing no damage. However 2 aircraft were destroyed against one in 1975. Where the bird was identified, 55% of the strikes occurred when the aircraft were flying at 250 knots and higher.

TABLE 1 AIRCRAFT ROLE

ROLE	AIRCRAFT TYPE		STRIKES PER 10,000 MOVEMENTS
STRIKE AND RECCE	**Netherlands**		
	F 104G		28.3
	RF 104G		14.5
	NF 5A		16.2
	Sweden		
	AJ 37		20.3
	SH 37		5.0
	S 35		7.7
	A 32		14.7
	S 32		13.4
	United Kingdom		
	Buccaneer		16.70
	Harrier		5.15
	Jaguar		8.51
	Vulcan		6.38
AIR DEFENCE	**Netherlands**		
	F 104,		20.1
	Norway		
	F - 5	(13)	NK
	F - 104	(9)	NK
	Sweden		
	J 35		3.8
	J 32		1.7

113

TABLE 1 AIRCRAFT ROLE

ROLE	AIRCRAFT TYPE		STRIKES PER 10,000 MOVEMENTS
	United Kingdom		
	Lightning		2.32
	Phantom		1.31
TRANSPORT	Netherlands		
	F 27		4.2
	PSC		3.2
	Norway		
	Falcon 20c	(1)	NK
	DHc - 6	(1)	NK
	United Kingdom		
	Andover		3.55
	Argosy		11.61
	Belfast		9.38
	Devon		1.00
	Hercules		5.91
	HS 125		4.64
	VC 10		2.51
MARITIME	Norway		
	P 3	(4)	NK
	United Kingdom		
	Nimrod		16.91

June 1976

TABLE 1 AIRCRAFT ROLE

ROLE	AIRCRAFT TYPE		STRIKES PER 10,000 MOVEMENTS
TRAINING	Netherlands		
	NF - 5B		17.4
	TF - 104G		14.9
	Sweden		
	Sk 60		9.3
	Sk 61		2.4
	United Kingdom		
	Bulldog		0.26
	Dominie		7.67
	Gnat		0.91
	Hunter		2.08
	JP		1.77
HELICOPTERS			PER 10,000 HOURS
	Netherlands		
	Alouette 111		1.2
	Bo 105c		4.4
	Norway		
	Sea King	(1)	NK
	Sweden		
	H kp 4) H kp 6}		4.7

115

TABLE 1 AIRCRAFT ROLE

ROLE	AIRCRAFT TYPE	STRIKES PER 10,000 MOVEMENTS
	United Kingdom	
	Puma	7.66
	Whirlwind	1.27
	Wessex	0.68

1.1 There is a minimum of 2 movements per flight.

1.2 Countries are not listed where they do not have aircraft operating in the particular role.

1.3 Aircraft with no recorded birdstrikes are not listed.

1.4 Where the strike rate is not known the number of strikes is in brackets after the aircraft type.

TABLE 2 AIRFIELD

AIRFIELD	NUMBER OF INCIDENTS	NUMBER OF MOVEMENTS	STRIKES PER 10,000 MOVEMENTS
1. DOMESTIC (data from own country with known no of movements).			
NETHERLANDS			
Leeuwarden	30	16,700	18.0
Volkel	10	24,348	4.1
Twenthe	20	15,078	13.3
Eindhoven	2	8,708	2.3
Gilze Rijen	6	11,212	5.4
Soesterberg	12	25,484	4.7
Deelen	5	28,994	1.7
SWEDEN			
F1 Vasteras	7	18,344	3.8
F/13M Malmslatt	7	16,144	4.3
F4 Ostersund	4	20,894	1.9
F5 Ljungbyhed	13	37,644	3.5
F6 Karlsborg	2	11,118	1.8
F7 Satenas	14	16,570	8.4
F10 Angelholn	5	24,182	2.1
F11 Nykoping	9	18,396	4.9
F12 Kalmar	7	14,652	4.8
F13 Norrkoping	4	16,834	2.4
F15 Soderham	4	11,576	3.5
F16 Uppsala	9	26,230	3.4
F21 Lulea	5	22,232	2.2

TABLE 2 AIRFIELD

AIRFIELD	NUMBER OF INCIDENTS	NUMBER OF MOVEMENTS	STRIKES PER 10,000 MOVEMENTS
UNITED KINGDOM			
Kinloss	6	6,789	8.8
Fairford	5	9,572	5.2
Brize Norton	15	31,022	4.8
Wyton	7	25,016	2.8
Lossiemouth	15	54,599	2.7
Macrihanish	2	7,282	2.7
Scampton	6	23,565	2.5
Lyneham	9	38,502	2.3
Finningley	9	39,376	2.3
Northolt	3	14,307	2.1
Benson	5	25,903	1.9
Marham	5	30,263	1.7
Church Fenton	4	31,769	1.3
Leuchars	4	31,996	1.3
Waddington	3	26,552	1.1
Leconfield	2	20,144	1.0
Honington	3	31,740	0.9
Coltishall	2	25,269	0.8
Cranwell	6	79,902	0.8
Coningsby	3	42,541	0.7
St Mawgan	2	29,280	0.7
Shawbury	4	59,445	0.7
Wittering	2	32,834	0.6
Valley	6	101,692	0.6
Odiham	2	46,041	0.4
Linton upon Ouse	3	78,180	0.4
Leeming	2	69,087	0.3

TABLE 2 AIRFIELD

AIRFIELD	NUMBER OF INCIDENTS	NUMBER OF MOVEMENTS	STRIKES PER 10,000 MOVEMENTS
2. DOMESTIC (incomplete data)			
NORWAY			
Bodo	6	-	-
Rygge	4	-	-
Gardemoen	3	-	-
Sola	3	-	-
Orland	3	-	-
3. DOMESTIC AIRFIELDS WITH SINGLE STRIKES	16	-	-
4. FOREIGN AIRFIELDS		-	-
5. FOREIGN AIRFIELDS WITH SINGLE STRIKES	-	-	-
6. EN ROUTE	259	-	-
7. UNKNOWN	77	-	-
TOTAL	690	-	-

June 1976

TABLE 3 BIRD SPECIES

COMMON NAME	LATIN NAME	APPROX WEIGHT	CATEGORY	NUMBER OF STRIKES	% BASED ON 261
Gull (various)	Larus sp	400–1800	B	48	18.4
Lapwing	Vanellus vanellus	200	B	39	14.9
Blackheaded Gull	Larus ridibundus	400	B	32	12.3
Swift	Apus apus	40	A	20	7.7
Wood Pigeon	Columba palumbus	500	B	17	6.5
Common Gull	Larus canus	400	B	14	5.4
Skylark	Alauda arvensis	40	A	11	4.2
Herring Gull	Larus argentatus	1000	B	8	3.1
Golden Plover	Pluvialis apricaras	170	B	6	2.3
Oyster Catcher	Haemotopus ostralegus	550	B	6	2.3
Starling	Sturnus vulgaris	100	A	6	2.3
Kestrel	Falco tinnunculus	200	B	5	1.9
Passerine	Passeriformes	20–110	A	5	1.9
Feral Pigeon	Columba livia var	400	B	4	1.5
Magpie	Pica pica	250	B	4	1.5
Partridge	Perdix perdix	400	B	4	1.5
Buzzard	Buteo buteo	1000	B	3	1.2
Fieldfare	Turdus pilaris	100	A	3	1.2
Sparrow	Passer spp	40	A	3	1.2
Swallow	Hirundo rustica	18	A	3	1.2
Thrush	Turdus philomelus	70	A	3	1.2
Corvid	Corvus sp	250–550	B	2	0.8
Curlew	Numenius arquata	800	B	2	0.8
House Martin	Delichon urbica	18	A	2	0.8
Mallard	Anas platyrhrynchos	1000	B	2	0.8
Pheasant	Phasianus colchicus	1000	B	2	0.8
Snow Bunting	Plectrophenax nivalis	35	A	2	0.8
Auk	Alcidae indet	900	B	1	0.4
Black throated Diver	Gavia artica	2500	C	1	0.4
Chaffinch	Fringilla spp	23	A	1	0.4
Crow	Corvus corone	550	B	1	0.4
Great Blackbacked Gull	Larus marinus	1800	B	1	0.4

TABLE 3 BIRD SPECIES

COMMON NAME	LATIN NAME	APPROX WEIGHT	CATEGORY	NUMBER OF STRIKES	% BASED ON 261
Great Tit	Parus major	20	A	1	0.4
Lesser Blackbacked Gull	Larus fuscus	800	B	1	0.4
Linnet	Acanthis cannabina	30	A	1	0.4
Meadow Pipit	Anthus pratensis	30	A	1	0.4
Redwing	Turdus iliacus	70	A	1	0.4
Ringed Plover	Charadrius Liaticula	50	A	1	0.4
Rook	Corvus frugilegus	400	B	1	0.4
Siskin	Carduelis spinus	18	A	1	0.4
Tern	Sterna Lirundo	100	A	1	0.4
Unknown	-	-	-	404	-
TOTAL		-	-	665	-

Notes:

3.1 The bird Categories based on current Civil Airworthiness requirements are:

CAT A below .11 kg (¼ lb)
CAT B .11 kg to 1.81 kg (¼ to 4 lb)
CAT C over 1.81 kg to 3.63 kg (4 lb to 8 lb)
CAT D over 3.63 kg (8 lb)

3.2 Those birds not positively identified are tabled as Unknown.

3.3 Percentages are based on the total of identified birds.

TABLE 4 PART OF AIRCRAFT STRUCK

PART	WEIGHT UNKNOWN	CAT A	CAT B	CAT C & D	TOTAL	% Based on 698
Nose (excluding radome and windscreen)	55	25	35	-	115	16.5
Radome	25	2	14	-	41	5.9
Windscreen	74	16	18	-	108	15.5
Fuselage (excluding the above)	52	9	31	1	93	13.3
Engine:-						
1 engine struck	49	18	28	-	95	13.6
2 out of 3 struck	-	-	-	-	-	
2 out of 4 struck	1	-	2	-	- 3	0.4
3 out of 4 struck	-	-	-	-	-	
all struck (on multi-engined aircraft)	-	-	1	-	1	0.1
Wing	42	12	46	-	100	14.3
Rotor/Propeller	6	1	6	-	13	1.9
Landing Gear	20	3	33	-	56	8.0
Empennage	8	1	9	-	18	2.6
Underwing Stores/Tanks	33	5	17	-	55	7.9
Part Unknown	53	11	19	-	83	-
TOTAL	418	103	259	1	781	-

Notes:

4.1 The Total in Table 4 and 4A may be higher than other tables, as one bird can strike several parts.

4.2 The percentages are based on incidents where the part struck is known.

4.3 Multiple strikes are counted as one strike, unless for example both wings or both landing gears are struck, when two incidents should be recorded.

4.4. Data obtained from 4 Nations.

TABLE 4A EFFECT OF STRIKE

EFFECT	Weight Unknown	CAT A	CAT B	CAT C	CAT D	TOTAL	% Based on 550
Loss of Aircraft	2					2	0.4
Flight Crew Injury							
Major							
Minor							
Slight			1			1	0.2
Engine damage requiring repair:-							
on single engined aircraft	4	2	8			14	2.6
1 on a 2 engined "	17	4	11			32	5.8
1 " 3 " "	-	-	-			-	
1 " 4 " "	-	-	4			4	0.8
2 " 3 " "							
2 " 4 " "	1	-	3			4	0.8
3 " 4 " "	-	-	-			-	
all engines on a multi	-	-	1			1	0.2
Windscreen Cracked / Broken	8	2	3			13	2.5
Radome Changed	5	1	4			10	1.8
Deformed Structure	13	-	7			20	3.6
Skin Torn/light glass broken	18	1	12			31	5.6
Skin Dented	30	6	25			61	11.1
Propeller/Rotor Damaged †	3	1	2			6	1.1
Aircraft System Lost	-	-	-			-	
Underwing Stores / Tanks damaged	10	1	9			20	3.6
Miscellaneous	3	-	9			12	2.2
Nil Damage	182	60	77			319	58.0
Unknown	24	5	11			40	-
TOTAL	320	83	187	-	-	590	

Notes:

4A.1 † Includes helicopter transmissions.

4A.2 Data obtained from 4 Nations.

June 1976

TABLE 5 EFFECT - AIRSPEED - WEIGHT OF BIRD

EFFECT / AIRSPEED / WEIGHT	0-80 A&B	0-80 C&D	81-100 A&B	81-100 C&D	101-150 A&B	101-150 C&D	151-200 A&B	151-200 C&D	201-250 A&B	201-250 C&D	over 250 A&B	over 250 C&D
Loss of Life/Aircraft												
Flight Crew Injured					1							
Engine Prematurely Changed	1				2		4		1		7	
Windscreen Cracked/Broken											4	
Radome Changed											2	
Deformed Structure							1					
Skin Torn/light glass broken									1		5	1
Skin Dented			3		2		3		1		12	
Propeller/Rotor Damaged					1				1			
Aircraft System Lost												
Underwing Stores/Tanks Damaged											4	
TOTAL	1		3		6		8		4		34	1

Notes:

5.1 The TOTAL in Table 5B is very small, as those incidents where the airspeed or the bird weight are unknown, together with the non damaging strikes, have been omitted.

5.2 Data obtained from 4 Nations.

ADF616117

Berne, 19 May - 2 June 1978

BSCE/13 WP 8

THE COMPUTER ANALYSIS PROJECT

J Thorpe - Chairman Analysis Working Group

1. The project involves the storage and analysis of data from bird strike reports from European Registered civil aircraft.

2. The UK CAA computer facility is to be used with BSCE members sharing the programming and annual costs.

3. The original proposals involved input of the data in code with the output in two forms

   (i) tabulated data in plain language similar to the form in which it is sent to ICAO

   (ii) tables of analysed data as used in BSCE/13 WP 7

4. The current proposal is to use a system similar to that used by the Australian Department of Transport. The number of incidents involving up to 18 bird species is tabulated against each feature eg aircraft type, altitude, aerodrome, month of year etc (see attachment). This layout enables the problem species to be identified against each of the areas of investigation. These tables, used in conjunction with aircraft movement data should considerably ease the task of completing the standard tables of BSCE analysis data.

125

PERIOD: YEARS OF 1969-1977 AUSTRALIAN AIR TRANSPORT - ALL OPERATIONS PAGE NUMBER 1

LOCATION: ALL ACCIDENTS/INCIDENTS INVOLVING BIRD STRIKES (IDENT=X)

BIRD SPECIES BY ENVIRONMENTAL & OPERATING CONDITIONS TABLE NO 1

WEIGHT CATEGORIES ARE: 1 FOR SMALL(<.11KG); 2 FOR MEDIUM(.11 TO 1.80 KG); 3 FOR LARGE(1.81 TO 3.63 KG) AND 4 FOR VERY LARGE

SPECIES NOT LISTED BY NAME: 99/87 98/42 59/11 01/06 56/41 45/27 17/16 80/03 68/08 31/12 54/03 61/40 40/13 28/05 23/04 52/04 88/84

SPECIES CODES WITH COMMON NAME, SCIENTIFIC NAME AND WEIGHT CATEGORY: NUMBER THIS ARRAY: 2495

02	BROLGA	GRUS RUBICUNDUS	4	43	SEE 21		
03/06/51/52	PARROT	PSITTACIFORMES	2	44/45	AUSTRALN MAGPIE	GYMNORHINA TIBICEN	2
07/09	COCKATOO	CACATUA SPP	2	49	OWL/FROGMOUTH	STRIG/CAP.FORMES	1-2
10	CORMORANT	PHALACROCORAX SPP	2-3	51/52	SEE 03		
11/12/64/66	CROW/RAVEN	CORVIDAE	2	53	MAGPIE LARK	GRALLIN.CYANOLEUCA	1
13	BSH STONE CURLEW	BURHINUS MAGNIROS.	2	55	DOMESTIC PIGEON	COLUMBA LIVIA	2
17/18/79	DUCK	ANATIDAE	2	57	SEE 28		
19	WEDGE-TLD EAGLE	AQUILA AUDAX	4	58	PLOVER	VANELLUS SPP	2
20/34/35/36	HERON	ARDEIDAE	2	60/61	MASKED PLOVER	VANELLUS MILES	2
21/29/30/43	HAWK	ACCIPITRIFORMES	2	62/63	PRATINCOLE	GLAREOLIDAE	1
22	FLYING FOX	PTEROPUS SPP	2	64/66	SEE 11		
25	GALAH	CAC.ROSEICAPILLA	2	65/70/82/83	WADER	SCOLOPACIDAE	1-2
27	SILVER GULL	LAR.NOVAEHOLLAND.	2	69	SPOONBILL	PLATALEA SPP	3
28/57	LARK	ALAUD/MOTACILLID.	1	70	SEE 65		
29/30	SEE 21			71	COMMON STARLING	STURNUS VULGARIS	1
31/32	NATIVE-HEN	GALLINULA SPP	2	75/76	SWALLOW	HIRUNDINIDAE	2
34/35/36	SEE 20			78	BLACK SWAN	CYGNUS ATRATUS	4
37/38	IBIS	THRESKIORNIS SPP	3	79	SEE 17		
39	JABIRU	XEN/CHUS ASIATICUS	4	82/83	SEE 65		
40	NANKEEN KESTREL	FALCO CENCHROIDES	2	98	CODED AS	OTHER SPECIES	
41/42	BLACK KITE	MILVUS MIGRANS	2	99	CODED AS	UNKNOWN SPECIES	

COLUMN HEADINGS REFER TO FIRST CODE OF EACH SPECIES GROUP LISTED ABOVE

	21	22	41	58	13	20	02	71	07	49	25	19	27	53	78	65	75	11	37	OTHER	TOTAL	X
MONTH OF OCCURRENCE																						
JANUARY	75	3		25	4		1		2	1	5		22		3	2	3	1	1	86	234	9
FEBRUARY	71	3	2	21	6		1	1		2	5	2	19		1	7	3	2		109	255	10
MARCH	72	6	4	22	2	1	1		3	1	8	3	13	1	2	2	6	1	2	149	299	12
APRIL	51	3	1	10	2			2			11	2	19	1	2	1	7	1	2	115	230	9
MAY	41	1	3	14	4	2	1	2	1	2	9	3	28		2	1	1	1	1	145	262	11
JUNE	31	1		24	3		1				12	2	28	3			2	1	2	105	215	9
JULY	17	2	1	8	1		3		1	2	2	1	18	2	1		1		2	69	131	5
AUGUST	37	2		15	1			2	3	1	10	1	9	2	1			2		81	167	7
SEPTEMBER	26	2		11	1			1			15	4	8	2		3	1	1	1	77	153	6
OCTOBER	40	3		9					1	1	7		10			14	1	1		82	169	7
NOVEMBER	36	1	1	13	1		1	1		1	4		15			5		1		91	171	7
DECEMBER	47	1		20			1			4	8	1	19	2		4	1	1		93	202	8
LIGHT CONDITIONS																						
DAWN	6			1							2		2			1	2			12	26	1
DAYLIGHT	516	12	11	163	9	2	8	9	9	3	90	18	158	13	7	30	22	13	9	903	2005	80
DUSK	2	2	1	5	2						1		4			1				31	49	2
NIGHT	15	14		22	13		2		1	11	3		41		5	7			1	225	360	14
UNKNOWN	6			3	1	1			1	1		1	3				2		1	35	55	2

LAND USE STANDARDS

Land Use	ALLOWABLE LAND USE Area A	Area B	Area C
INDUSTRIAL (Note 5)			
quarries (if seldom worked, abandoned and containing water)	No	No	No
food processing plants	No	No	Yes
manufacturing facilities	Yes	Yes	Yes
MUNICIPAL UTILITIES (Note 5)			
sanitary landfill	No	No	No
garbage disposal	No	No	No
sewage treatment	No	No	No
water treatment	Yes	Yes	Yes
water storage (reservoirs)	No	No	No
TRANSPORTATION			
highways	Yes	Yes	Yes
railroads	Yes	Yes	Yes
port facilities	No	No	No

NOTE No. 5 Flat roof buildings which may, be design or by accident, retain water on their surface, are not recommended within Area A unless the water is not accessible to birds.

Airport Operational Standards for Bird Hazard Control

Another responsibility for Ottawa Headquarters Management (i.e. Corporate Management) is to publish airport operational standards which serve as controls on airport site management. Again our Operational Standards for Bird Hazard Control are based on the 76 Research reports published by the National Research Council Associate Committee on Bird Hazard to Aircraft. The contents of these Airport Operational Standards are as follows:

Operational Standard No. 1 — Land Within 1200 Feet of Runway and Within Infield Areas

Any land within 1200 feet of any runway centre line, or runway end, and within infield areas, shall not be used for the growing of oats, corn, sunflowers, rye, barley, wheat and other cereal crops, market garden crops, fruit bearing trees or plants. Hay, clover, or alfalfa may be grown in this area, except at those airports where the annual bird strike rate is greater than five strikes a year.

PERIOD: YEARS OF 1969-1977
LOCATION: ALL

AUSTRALIAN AIR TRANSPORT - ALL OPERATIONS
ACCIDENTS/INCIDENTS INVOLVING BIRD STRIKES (IDENT=X)
BIRD SPECIES BY ENVIRONMENTAL & OPERATING CONDITIONS

PAGE NUMBER 3
TABLE NO 1

	21	22	41	58	13	20	02	71	07	49	25	19	27	53	78	65	75	11	37	OTHER	TOTAL	%
PART STRUCK																						
RADOME/NOSE	38	2	1	10	1			2	1	1	9	2	12		2	2	4	1	1	93	182	7
WING	81	6	4	15			3	1	2	1	15	6	22	2	1	5		3	1	114	282	11
POWER PLANT/PROPS	56	3		20	2	1		1	1	2	11	4	27	1	3	2	2	3	2	112	253	10
WNDSCREEN/COCKPIT	44	2	4	4				2	2	1	4	1	12	3		4	6		3	116	208	8
FLAP/FUS/ANTENNAE	45		1	7	1		2			2	8	1	14	1	1	2	5	1		74	165	7
LANDING GEAR	35	4	1	9	2		1		1	3	7		12			1				52	128	5
EMPENNAGE	2			1	1							1	1					1		7	14	1
OTHER/UNKNOWN	244	11	1	128	18	2	4	3	4	5	42	4	108	6	5	23	9	4	4	639	1263	51
DAMAGE																						
DESTROYED																						
SUBSTANTIAL	2						2				1	1	1							9	16	1
MINOR	41	5	6	5			2		2		10	5	16		4	1	2	2	1	106	208	8
NONE	502	23	6	189	25	3	6	9	9	15	85	13	191	13	8	38	24	11	10	1089	2269	91
UNKNOWN/NR																				2	2	
AIRCRAFT LIGHTS																						
NAVIGATION																						
LANDING																						
ROTATING																						
STROBE																						
WING																						
UNKNOWN/NR																					2493	100
YEAR OF OCCURRENCE																						
1969	75	5	1	29	4		2		2	2	21	2	50	1	1	4	6			195	400	16
1970	78	3	3	18	2			2	1	3	18	1	37	1	1	5	2	2	3	207	387	16
1971	55	4		11	3			1	3		10	4	29	2	2	6	5	3	2	150	290	12
1972	38	5		13	3		2	1	2	1	7		16	1		10	3	1	2	127	232	9
1973	69	4	3	25	7		1			2	12	2	27			2		2		134	290	12
1974	42	3	3	30	4		1		2	1	11	4	14	2	3	6	5	2	1	124	258	10
1975	66		1	25	1	1	2			3	6	1	17	4	3	2			2	115	249	10
1976	76	3	1	30	1	1	1	3	1	1	6	1	7	1	1	3	2	1		85	225	9
1977	45	1		12		1	1	2		2	5	4	10	1	1	1	3	2	1	65	157	6
1978	1			1									1							4	7	
TOTAL	545	28	12	194	25	3	10	9	11	15	96	19	208	13	12	39	26	13	11	1206	2495	
% OF TOTAL	22	1		8	1					1	4	1	8	1		2	1	1		48		

Discussion on WP 8

Ferry had some comments concerning the background to the planned computer based data system.

13th Meeting on Bird Hazards to Aircraft (BSCE-13)

Report from an ICAO workshop on reducing birdhazards.

L-O Turesson, Sweden

Abstract:

An ICAO Workshop on reducing bird hazards was held in the ICAO regional office of Bangkok 20-23 March 1978. Upon request from ICAO some BSCE members assisted in the workshop, presenting papers and moderating discussions. There were 32 participants from 14 states in the Far East & Pacific region and 5 participants from IATA. - The workshop was planned and organized by the Air Navigation Bureau of ICAO Headquarters and the local arrangements were carried out by the regional office in Bangkok.

Background:

The idea of holding a workshop in the Far East & Pacific region of ICAO concerning the bird problems of aviation came up already in 1973 at the Asia/Pacific Regional Air Navigation Meeting. It was found for various reasons, however, that the time was not yet ready for such an event and also some later plans have not been possible to realize. In connection with the last World Conference on Bird Hazards to aircraft, which was held in Paris, October 1977, the intention to hold a workshop was taken up again and soon after the Paris conference ICAO decided to do so. In the meantime the organization had also got in touch with BSCE asking for suitable persons to assiste in a workshop. After the final decision to go on with this project ICAO sent a letter to the employers of the designated persons asking for assistance by making these experts available for participation in the workshop.

It was possible to do so for all members that BSCE had proposed for the task and the list of experts got the following appearance:

B Bruderer	Schweizerische Vogelwarte, Switzerland
V E Ferry	Direction Générale de l'Aviation Civile, France
W Keil	Deutscher Ausschuss zur Verhütung von Vogelschäden im Luftverkehr, West Germany
V E F Solman	Department of environment, Canada
J Thorpe	Civil Aviation Authority, UK
L-O Turesson	Board of Civil Aviation, Sweden.

ICAO had designated K K Wilde from its headquarters in Montreal as responsible for the organization of the workshop and C-O Nordlander of its Far East and Pacific region as responsible for the local arrangements in Bangkok.

Opening

The workshop was opened by the deputy representative of ICAO regional office in Bangkok, Mr P M Peralta. He mentioned the historial background of the workshop and expressed his pleasure for the fact that it had now finally become possible to realize this event. A good result of the workshop was assured, he meant, by the group of experts that had been possible to bring together!

Mr K K Wilde, chief of the AGA Section at the Air Navigation Bureau of ICAO headquarters scetched the main lines of the coming work, explaining the different items of the agenda. He also expressed his satisfaction with the fact that so many ICAO memberstates in the Far East & Pacific region were represented and that the total number of participants was as high as 32, 5 delegates from IATA not included.

In the evening of the opening day ICAO regional office gave a reception at the Sheraton hotel of Bangkok with Mr & Mrs Peralta as hosts. Besides the participants of the workshop there was also invited some people from the field of aviation in Thailand including several representatives for airlines with traffic to Bangkok. The reception was very much appreciated by both participants and lecturers at the workshop as a "bringing together" at an early stage and also making possible contacts with airline people.

Participation

The following 13 ICAO memberstates from the Far East & Pacific region were represented at the workshop:

Australia
Brunei
France
HongKong
India
Indonesia
Japan
Malaysia
Pakistan
Philippines
Singapore
Thailand
USA

The most numerous delegations had Japan with 6 and Indonesia with 4 participants. Even if not belonging to this region Uganda had asked ICAO for permission to take part in the workshop and they were of course welcomed to do so. Uganda has shown an unusual interest in the bird problems of aviation during the last year both at the world conference in Paris and now in Bangkok. Their working papers at both occasions also show that there are difficult problems at the airport of Entebbe.

IATA indicated that they are highly interested in the matter by sending 5 delegates to the workshop. They represented the IATA office in Bangkok, Quantas Airways of Sydney, Australia and Lufthansa of Frankfurt, West Germany.

Agenda

Agenda Item 1:		Overview of the problem
	1.1:	Strike rates/accident records
	1.2:	Bird movements and population in SEA/PAC Regions
	1.3:	Susceptibility of aircraft to bird strike damage
	1.4:	ICAO position and acitivities
	1.5:	Experience in Canada
Agenda Item 2:		Environmental management
Agenda Item 3:		Dispersal techniques and devices
Agenda Item 4:		Radar Observations
Agenda Item 5:		AIP and NOTAM commnication procedures

Agenda Item 6:		Organization
	6.1:	At the aerodrome
	6.2:	At the national level
	6.3:	At the regional level
	6.4:	Bird strike reports
Agenda Item 7:		Regional Bird Strike Committee
	7.1:	Experience in Europe
	7.2:	Organization in regions

Way of working

Each of the 6 BSCE experts, was responsible for one of the agenda items.1 to 6. They had prepared one or more working papers for their resp items. If the time so had permitted the papers had been sent out in advance to the member states of this ICAO region. Also a IATA paper had been prepared in advance of the workshop. When this started many of the participants delivered further working papers so the total number of them went up to as high as 37.

Most of the papers were presented during the workshop under the agenda item they belonged to. For some of the papers, however, the time permitted only that a short information was given about them. - In order to cover as much as possible under each agenda item the workshop started as early as 8 o'clock every morning Tuesday through Thursday.

The BSCE-expert responsible for a specific item also had the task to moderate the discussions after each presentation and at the end of his item. Many of the participants were very active during the discussions so we really got to know a lot about their problems and we also had the possibility to tell them about our experiences in Europe.

Agenda item 1: Overview of the problem

J Thorpe, UK, was moderator for agenda item No 1 and started with the presentation of his paper, DP/9, "Bird strikes in South East Asia/Pacific region". The paper is an analysis of about 300 strikes in the region reported by civil aircraft of over 5700 kg. Noticeable is among other things that in 25% of the incidents damage is caused, which is about 5 times the rate in Europe. Also worth mentioning is the high proportion (64%) of strikes caused by birds of prey. The top rate has in many countries the black kite, which has a weight of 1 kg and mostly appears in flocks.

P M Davidson, Australia presented his paper: "Susceptibility of aircraft to bird strike damage". The document provided interesting details for 5 of the most serious occurences in Australia during the period 1969-1976. All of these strikes happened to big passenger aircraft with gulls involved in two cases and large birds in the others. - Considering the total bird strike situation in Australia it was evident that large birds such as pelicans ibis, eagles and hawks tend to inflict the most damage. - At a later occasion of the workshop Davidson showed some slides with aircraft damage by birds.

It was also revealed (had not been known to BSCE before) that the Civil Aviation Authorities of Australia had introduced automatic data processing of bird strike data. The experience gained from this system can certainly be used for the planned BSCE automatic databank.

"Susceptibility of aircraft to bird strike damage" was the title also of a paper presented by V D Moorthi of Air India who is presently working for the IATA office in Bangkok. He showed in tableform those birdstrikes occuring to IATA airlines in the Far East & Pacific region during the period 1972-1977. The costs for the strikes was also given for all cases where it was known. Among data available in the latter table can be mentioned that during 1976 6 airlines suffered birdstrikes to a cost of $2 millions.

The paper also discussed whether it is worth requiring stronger structures and engines to reduce the amount of damage caused by the significant bird strikes or not. It was stressed that an increase in strength of the critical areas of the aircraft (windshield, leading edges of wing and tail surfaces, engines, radomes) would probably reduce, although not eliminate, the total cost of bird strike damage but would also certainly lead to an increase in weight. As an example was mentioned an assumed strengthening of all aircraft belonging to the ICAO nations by material for each weighting 1000 lb which would lead to an increase in the purchase price of

about $ 600 millions and in the operating costs of $ 35 millions per year.

K Wilde of the ICAO headquarters presented a paper on the agenda item 1 with the title "ICAO positions and activities". He formulated there the acitives of ICAO concerning the bird problems in a way that the "Organization must do what it can within its resources to:.

1) reduce the risk of bird strikes occuring;

2) improve the airworthiness of aircraft to bird-strikes; and

3) make States more aware of this problem".

The paper in one section called "Reducing strikes" described what ICAO has done on the bird strike problem over the years. This review stated that one of the most important ICAO actions was the inclusion in 1969 of a Recommended Practice in Annex 14 saying that:

"The appropriate authority should take action, as necessary, to decrease the number of birds constituting a hazard to aircraft operations by adopting measures for discouraging their presence on or in the vicinity of an aerodrome".

The development of the Airport Services Manual, Part 3 "Bird Control and Reduction" was also mentioned. ICAO has prepared this manual with the help of Canadian authorities and it has recently been revised with the aid of Bird Strike Committee Europe.

Another section of this paper dealt with "Airworthiness aspects" and explains what ICAO has done since the early nineteen sixties for the "development of detailed airworthiness requirement to enable aircraft to withstand bird strikes". The work of the ICAO Airworthiness Committe about this problem was reviewed quite comprehensively ending up with the conclusion of this Committee in 1976 that "the 1,71 kg (4 lb) bird criteria used in national regulations of some countries was satisfactory and should form the basis of any ICAO specifications for the design of aeroplanes".

After this presentation there was some discussion. Wilde underlined here that ICAO is considering to give help with the system for automatic processing of bird strike data that is planned by BSCE.

Ferry asked if ICAO is considering any revision of its form for bird strike/incident reports.

Thorpe had the opinion that each memberstate had to decide itself about the form to be used if the recommendations of ICAO concerning the content were fulfilled. Wilde stressed that ICAO had not been asked to revise its form and does not have any actual plans to do so.

Other speakers had the opinion that the smallest possible number of form was an advantage for the international work. Turesson informed here that Sweden has reduced its number of forms from three or four to one.

V E F Solman of the Canadian Wildlife Service presented a paper about the Canadian experience of the work with the bird problems.

The history of bird strikes in aviation was scetched from the first strike in 1912 to the early sixties with the well known serious birdstrikes which occured then in U S A. Also Canada had difficult problems and therefore formed their Committe on Bird Hazards to Aircraft.

The necessity of good knowledge of the bird situation in an airport was underlined. When the bird problems are defined and the knowledge of how to tackle them is available the work can start. - The paper contained all different points of the work and the most important ones were specially stressed in the presentation. The enormous problems in Canada with north/southerly bird routes and east/westerly air routes for human beings were also mentioned.

In a discussion after this presentations Omar bin Saman of Malaysia asked if it was really necessary to continue with bird strike statistics when it has been going on for several years.

Solman said that the birdsituation of an airport can be changed and that the art and effectiveness of the bird reducing work have then to be adapted to the new situation.

Thorpe referred to a recent article in Newsweek (10 February) about the bird strike risks for aviation.

The participant from Hongkong, D Melville, had compiled a very comprehensive paper with bird strike data from Kai Tak airport of Hongkong for the years 1974-1977. The statistics contained tables and diagrams showing both reported strikes and the number of dead birds found. It was evident that the latter number was much higher than the number of strikes in spite of the fact that in most strikes only one bird was involved and that sometimes birds of prey find the dead birds and pick them up before the airfield staff. However,

an unknown percentage of birds are killed by wake turbulence behind starting and landing aircraft.

In the discussion after the presentation of this paper it was announced that the Australian Department of Transport had published a book entitled: "Guide to the recognition and reduction of aerodrome bird hazards". Among other things this book reports of similar studies of the bird strike situation of airports as the HongKong document. A list for those interested to get one or more copies of the book was circulated and the book has been distributed during the month of April this year.

Major Wong Ah Ngam of the Malaysian Airforce presented a paper "Bird strike report" with the number of birdstrikes for the years 1970-1977 and summaries of the birdsituation in the different provinces of the country during the seasons of the year.

The lecturer highlighted the intense migration of birds along the East coast of Malaysia which is believed to cause difficulties for airports of this area. As a conclusion from his point of view about the content of the whole agenda item No 1 (the paper was the last one of this item) the lecturer submitted two proposals concerning the agenda of possible future workshops of this type:

1. The agenda should contain more about bird movements and less statistics

2. Methods for the improvements of the aircraft structure and strength to withstand strikes must be stressed very much.

   The board of the workshop expressed its gratitude for contributions of this type and also pointed out that experiences and thoughts about this workshop was intended to be discussed at the end of the session.

Agenda item 2: Environmental management

V E F Solman, Canada, was mdderator for agenda item No 2 and presented a paper, DP/4, with the title: "Environmental management of airfields to reduce bird hazards".

The leading thread through this paper was the first sentences of the abstract: "The components of the environment may together offer great attractions to birds on airfields. Modifications of the components can reduce or increase the attraction". About the airfield problems it was generally said that " it may be necessary to carry out construction, to modify drainage structures, plant cover and even buildings to make the airfield environments less attractive to bird so they will leave the area and not constitute birds hazards."
A considerable part of this paper dealt with the airfield soil and the necessary vegetation cover. In Canada they have made comprehensive studies during many years with the aim to find an ideal plant not offering bird attractions, stabilizing the soil, preventing erosion during heavy rains and not being a fire hazard. Unfortunately they did not find any plant with all those useful charateristics so a mixture of grasses is still found to come closest to the optimal goal. The management of the airport with all its details affecting the birdsituation was also discussed: the availability of water including the drainage situation, the disposal of food wastes, the use of land in and near the airport, the architecture of the airport buildings etc.

At a discussion following the presentation of this paper E Edroma of Uganda asked for advise concerning their Entebbe airport with its difficult birdsituation being almost surrounded by lake Ukerewe (Victoria). Solman had the opinion that in this case birdpatrols might be necessary.

W Keil of West Germany presented his paper, Dp/23: "Birdstrike management on airports on the base of a biotop-expertice".
The paper also covered organizational problems of this type of workig on airport. In this respect the paper shortly explained the "Regulations for the prevention of collisions between birds and aircraft" that was issued by the German Federal Ministry of Transport in 1974. The background to these regulations was a very comprehensive researchprogramme that lasted for 10 years. This research programme was made up by studies in the airport and its vicinity of birds and other animals, vegetations, watersituation (rivers, ditches, lakes, gravels), garbagedumps tec.

As one of the main points of the regulations was stressed the demand for biotop expertice for initial studies of the environmental conditions of the airports and follow up programmes of them.

As a whole the regulations had about the same content as the Canadian recommendations but were perhaps more detailed.
The presentation of this paper was illustrated by a number of slides from the airports of Frankfurt, Köln-Bonn, Bremen and Hamburg. In a discussion after the presentation some specific problems concerning parts of the regulations were taken up and discussed.

The presentation by P M Davidson of a paper entitled: "Environment management" showed that Australia had some regulations too concerning environmental problems of airports but reduced to the exposure of waste foodstuffs. The regulations had been invoked to eliminate the attraction of birds to two garbage dumps near Sydney airport.
As an essence of environmental management the paper underlined the effectiveness of encouraging the birds to change their pattern of living so they do not come into conflicts with aircraft so often. In an attachment to the paper was delivered a draft with notes to be used at aerodrome inspections of air safety problems caused by birds. The notes were very detailed and must be looked upon as a good help for an inspection of these matters.
In a discussion after this presentation Davidson pointed out the black kite as the worst bird for airsafety in Australia. Solman meant, however, that besides this fact the conditions seemed to be rather similar in Australia as in Canada.

V E Ferry, France, chairman of BSCE, presented the two French films om the subject of bird strike problems: "Láile apostrophe (interceptible wings)" and "Les oiseaux et des anges (bird and angels)" The former one gives the elementary views on the bird strike problems in a very nice way showing the different flight phases (departure, on the route flight, landing) of both birds and human beings as well as possible methods to separate the movements in and near the airport of the two airspace users. The latter film shows information on more advanced studies of birds movements as seen by radar, resistibility of aircraft structures against foreign objects etc.
As the first film stressed the dangers for aviation of garbage dumps in the vicinity of airports a discussion developped on this matter. Information was given concerning international and national recommendations dealing with distances from dumps to airports, etc. Turesson also mentioned decisions by Swedish authorities for environmental conditions that deposition of waste near airports (within 4 miles radius) is permitted only if arranged in such a sophisticated way that birds will not be attracted to the plants.

J J Gwahaba of Uganda presented a paper: "Causes for the presence of birds at Entebbe international airport, Uganda". The paper explained a recently performed study of the birds life on and around Entebbe airport. Many species of big birds live in this area that forms a peninsula out in lake Ukerewe. Black kites give most problems but there are also geese, ibises, ducks etc. The kites are here particularly dangerous because of their curious habit of resting on the runways doing nothing. The purpose of the study was to find measures to reduce the number of large birds on the ground and its also believed that this will be possible by some drainage actions.
In the discussion after this presentation Davidson said that they had similar experiences with black kites also in Australia. The behavior of this birdspecie is causing unusually difficult problems which have not been able to solve so far. Edroma had a theory that the kites sometimes land on hot runways in order to warm up their feet after an earlier cooling at high level flights during soaring.

Agenda item 3: Dispersal techniques and devies

W Keil, West Germany, was moderator for agenda item 3 and also presented a paper: "Possibilities for ad-hoc dispersals of birds from an airport - a general way". The paper dealt shortly with a great number of scaring methods: different types of visual as well as accoustic means for bird dispersal , falconry, trapping, poisoning and hunting. The necessity of changing method from time to time or to combine two or more methods with each others was specially stressed. Local experimental work has to be done in order to find out which method or which combination of methods is the best one for the bird species of a specific area. Here was also pointed out the importance of a good knowledge about those bird species that are most dangerous for the airtraffic. In the discussion after this presentation A Mohluddin of Pakistan explained the main birdproblems of airports in his country. Vultures and kites were mentioned as the species causing most strikes. A V Souza of Singapore wanted some complementary information about the German way of trapping crows and Keil explained this more in detail.

V E F Solman presented a paper entitled: "Bird dispersal techniques and devices" which among other things underlined the motivations for bird dispersal at an airport. "Dispersal must be done by knowledgeable, dedicated staff who understand the need for and the effective application of the methods selected" The work is often difficult and its necessary to use scaring methods repeatedly to drive away the birds whenever they come back in order to keep bird strikes at an acceptable level.
The necessity in some airfields to use liveammunition and kill birds was discussed after this presentation. Solman here stressed that killing/shooting of birds should not be used until all other methods had been used. He also said that a hurted bird on the runway can cause confusion and that it had happened that a pilot refused to depart because a hurted bird had been surrounded by other birds. Fieldstaff had to take care of the hurted bird and there was a delay of 20 minutes at this occasion.

P M Davidson of Australia presented a paper with the title "Dispersal techniques and devices"

A large number of different bird dispersal techniques and devices had been evaluated at Australian aerodromes and of all these the most effective method was to have "a mobile patrol of aerodrome personnel in radio contact with the control tower and armed with bird-scaring cartriges and live ammunition".

In the paper was also included technical instructions for safe and effective use of firearms issued by the Australian Department of Transport. This was a very comprehensive document of 7 pages plus an appendix with "Safety precautions for the handling of firearms and ammunition".
Following this presentation it was quite natural with a discussion concerning the necessity to be careful with the use of guns and pistols for birdscaring. Accidents have happened, i.e. in Sweden a pistolbarrel exploded some years ago.
An inquiry was done around the table about the use of shellcrackers. It was found that they were used in most countries but some states, like Malaysia, preferred shotguns.

Agenda item 4: Radar observations

Moderator for agenda item 4 was B Bruderer of Switzerland who presented a paper with the title "Possible use of radar for the prevention of bird/ aircraft collisions". He stated that the aim of the paper was to outline possibilities and limitations of radar application against bird strike of civil aircraft (which may differ from one region to the other) and to suggest research work, where limitations are unsufficiently known.
The author had studied the frequency in different countries of bird strikes beyond the confines of the airports and found values varying between 7 and 25% of all strikes. As the proportion of this type of strikes varied so much it was found valuable to define them for areas of interest and here quantitative radar observations and bird strike reports are the main tools to get the necessary information.
Dealing with the sources of risk the paper divided bird flights relevant for radar studies in two categories: local movements (at low levels,usually with a regular twice-a-day traffic) and migratory movements (with high variety of flight levels and flying times). Studies of birds migration with the aid of radar were explained rather detailed with data about the height of migration, intensity of migration, etc. Questions were here raised whether flights at high level of large birds are confined to certain times and/or routes, if they are so regular in space and time that maps can be drawn and/or forecasts are possible and finally if they are so clearly observable on radars that actual warnings are meaningful. It was the opinion of the lecturer that so-called migration maps are of limited value for civil aviation.
The limitations of new surveillance radar equipments were also highlighted in this paper. This type of radar incorporates digital or computer-aided data processing , which exclude unwanted targets, such as birds. Only raw radar displys can be used for bird studies.
Finally the paper underlined that in most countries only local movements are so regular that warnings can be issued and the air traffic service have use of them. In less frequented air space, however, adaptions of flightplans, flight levels or flight paths are possible (example: Canada).

In the discussion after this presentation Montgomery asked what a pilot can do in order to avoid birdstrikes, specially on approach.

Solman went through the few possible measures stres-sing reduce of speed as an important maneuvre. Ferry related a case where a small, twin engined jet aircraft had a collision at a level of 3500 ft in clouds above Paris. It took 30 minutes to get control of the aircraft. Turesson mentioned the possibilities for civil aviation to manage in the same way with schoolflights as the militaries do with their aviation.

Agenda item 5: AIP and NOTAM communication procedures.

V E Ferry, France, was moderator for agenda item No 5 and presented a paper (in French) with the title:"Sommaire guide de discussion"

The paper emphasized that there are two inportant conditions which must be fullfilled in order to make it possible to prevent (or to reduce) birdstrikes:

- a knowledge as good as possible about the risk
- distribution as fast as possible of information about the risk.

For a quick distribution its necessary with the development of a network of observation stations, safe means of communications, a code for the reduce of the length of messages and a basic documentation. The network of information was then described more in detail i.e. bird observations visually or by radar performed inside or outside an airport. There was also a division beween studies of local or migratory movements.

The way of communication including the code now in use in western Europe was explained. A list of the different types of basic information to be published in the various documents of civil aviation i.e. maps of migration routes and bird concentration areas, ended the paper.
To the paper belonged also a French circular from the "Service de l'information aeronautique" about the prevention of risks for aviation dealing mainly with the content of BIRD WARNINGS and how they are communicated in France. Another appendix to the paper was a serie of French aerodrome maps with essential bird routes marked.

There was a short discussion after the presentation of this paper dealing mainly with the coding of messages and with the expected value of them.

Agenda item 6: Organization

L-O Turesson, Sweden, was moderator for agenda item No 6 and also presented papers for the different subitems: at the aerodrome, at the national level, at the regional level and bird strike reports. It had been decided before the opening of the workshop that agenda item 7 should be included in item No 6.

"Organization at the aerodrome" underlined that there is no other section of the work with the bird problems where so much can be done in order to avoid collisions between birds and aircraft as when it comes to the activities in the airport. The organization of this work is therefore of utmost importance.
It was recommended in this paper to have a working group for the total work with prevention of bird strikes in the airport. For the field work a special bird patrol can be set up in bigger airports with difficult birdproblems but in smaller airporte its normally not possible to employ staff only for bird scaring. Examples of organizational solutions (UK and Denmark) were shortly described. Finally was mentioned the "special methods for the limitation of bird population" in Denmark that are refered to in the ICAO document "Airport Services Manual, Part 3, Bird control and reduction" para 7.11.

The paper about the "organization at the national level" stressed that the problems created by collisions between birds and aircraft must be looked upon as air safety problems like many others of the aeronautical service complex of problems. Here was also cited an important part of a paper for the world comference 1977 of R B Campbell, Canada.
After that the paper gave a rather comprehensive account of how to form a national committe mentioning all types of officers suitable for such a group and the different tasks of it. Just to give an idea of the content might here be cited the subtitles pointing out what kinds of work that can be carried out by a national committee on bird hazards: strategic planning (specially the preparational work for a new airport), information and education, bird strike statistics, actions in the airport including special studies and research, inspections of airports, bird intensity forecasts and mapping of bird concentration areas, communications and . international work.
The importance of good public relations was also highlighted.

P M Davidson contributed to this agenda item with short papers explaining the organization both at the aerodrome and at the national level in Australia.

The high importance of frequent inspections of aerodromes was emphasized. Information was also given about the Australian organization of the Department of Transport into a central and 5 regional offices where each region has a committe on bird hazards to aircraft. This regional organization depends on the large size of the country.

V E F Solman presented a paper entitled: " Organization for the control of bird hazards to aircraft". In the abstract of this paper was stressed that such an organization "must bring together persons from several disciplines who can examine the problem from many points of view". The paper also stated the necessity of a good chairman for a possible committee saying that any organization is only as good as the abilities of the members and the vision and leadership of the chairman. The Canadian organization was explained giving rather detailed information about the tasks of an inspector of aerodromes.

After the presentations of papers dealing with the subitems 6.1 and 6.2 there was a discussion on related matters. The constitution of a national committee should have the widest possible representation was the opinion of V Solman. He also cited some important paragraphs of the Canadian instruction on this type of work. E Edroma meant that in the practice its difficult to comply with all demands and also to have a big national committee. L-O Turesson agreed, saying that a committee with participants from all parties concerned might form a too big group.
Edroma also raised the question if a special secretariat is needed at a national level for a successful work. It seemed, however, as if the majority of the experts present did not feel this as a necessary thing.

"Organization at the regional level" was also presented by the moderator for this item. The paper referred very much to the work of BSCE and experiences from there so therefore it also covered to a great extent the purpose of the original agenda item 7.1.
In the paper is stated as the main advantage with a regional committee that it gives a good "possibility for all participating states to keep each others informed about all studies going on within this field of work and how the total work is organized in the different countries".
The history of BSCE and contacts with other organizations was described with an emphasis on the cooperation with ICAO. Further was explained the different ways of working of the committee mentioning the annual conferences, the aim of the so called "Editing committee, the activities of the working groups, work by the aid of correspondence etc.

The paper was illustrated by an example of working papers for a BSCE conference (BSCE/11), recommendations after BSCE/11 based on the activities of the working groups, terms of refernce of the Editing committee, pictures showing the aim of the working groups in a humorous way and an outline of the different mediums and of the ways of working of BSCE.

The last paper presented under this item and also during the whole workshop was "Bird strike reports" (subitem 6.4).
The introduction of this paper stated that: " Experiences have shown that for the management of the airfield and for the use of land both inside the airport and in the environments studies of birdstrike reports are very valuable.
Bird strike/incident report forms were described as well as the purpose of them. As an example was attached the Swedish form (similar to the ICAO one) and also a well completed report of a bird strike. The result of an inquiry to pilots about their knowledge of the bird hazards was shown too.
Organization for the distribution of bird strike/incident reports was given a rather large space in this paper. Examples were given for a correct handling of reports if collisions had taken place in different airports of this region.
Finally was underlined the importance of studies of the bird situation in an airport by the aid of a special reporting system. In that way the real occurrence of birds dangerous for aviation in an airport will be safer and quicker laid down. That type of studies has been carried out in many countries in western Europe and also in Australia and Hongkong.

After the presentation of papers on agenda items 6.3 and 6.4 there was a discussion mainly on the system for distribution of bird strike reports. It was evident that many different systems were in use. Some states have reports only from pilots whereas other states also include reports from air traffic controllers, field staff and aircraft maintenance personnel (in some cases on different forms).
The delegates from IATA had here the opinion that all different means should be used in order to make the reporting system as efficient as possible.
Difficulties with the identification of birds involved in collisions with aircraft was also stressed and Field Note No 51 on names of birds in English and Latin issued by the National Research Council of Canada was mentioned as a help with these problems.
J Thorpe informed about the content of "Serious bird strikes bulletin" issued by the Civil Aviation Authority of U K in co-operation with BSCE. These bulletins contain reports from the most difficult strikes of the world which come to the knowledge of C A A and so far three issues have been published.

Studies of serious bird strikes have among other things revealed that some types of engines are more sensitive to bird ingestion than others.
V E Ferry underlined the importance of good contacts with other international organizations. There is a need of constant exchange of information and of knowledge from experience.
He also focused the attention on the significance of the activities carried out in the periods between metings.

Fieldtrip to Bangkok airport

During the workshop a fieldtrip to Bangkok airport was arranged for all participants. After the arrival we were received by the airport manager and some members of his staff who gave us a general idea of the airport in form of different types of statistics also including information on the bird strike situation. It was claimed that Bangkok so far had had a low frequency of birdstrikes but according to the opinions of the IATA-representatives it was evident that all reports from foreign airlines had not come through. One main impression from the visit to the airport which is also of importance for the occurence of birds was that the whole area was very clean.

The studies also included a visit to the Aviation Museum of the airport with a great number of old airplanes and helicopters. The participants of the fieldtrip were quite impressed by the size of the museum and the nice arrangement of the aircraft. It was also evident that everybody was pleased for the possibility to get an inside glance to the management of an airport in this region.

After the arrival back to the city and the ICAO office there was a short discussion about things that had been observed during the fieldtrip. Solman then expressed his impression for the fact that the bird population of the airport seemed to be so low in spite of the numerous waters in the surroundings. He said that there must be some birds in the approach areas that are difficult to get sight of. Melville thought that there had been a specially low frequency of birds at the time for the visit because this was done during the hot early afternoon hours. Solman also gave his compliments to the airport authorities for a clean airport. They have done a good job, he said! Thorpe and Keil expressed the same opinion.

Concluding discussions

When the workshop had finished its agenda K Wilde of ICAO headquarters took up a discussion on two important matters:

1. What can be done to improve the national work in the different countries?

2. What can be done to improve the international co-operation in this region when it comes to the bird problems of aviation?

In the discussion starting up on the above mentioned matters representatives of IATA had the opinion that establishing of national committees in the ICAO member-states of the region was desirable.

After this contribution a question was raised around the table concerning the presence of national committees in the area. The inquiry showed that only Japan had a national committee on birdstrike problems.

Uganda, belonging to another region, had also such a committee which was said to have a strong position.

The representative of Brunei said that they have a Flight Safety Committee which also takes care of the bird problems. He also said that the workshop had been very valuable and expressed gratitude to ICAO for the initiative to the meeting. Indonesia pointed out their difficulties for geographical reasons (very large extension of the country East/West) to form national committees.

Australia has administrative resources for taking care of this problem but they don't have a real national committee for birdstrikes. They have also geographical difficulties for establishing of national committees of this typs so they have gone in for a regional organization.

The representative of Thailand said that they have no committee but he was going to request the formation of such a group.

The representative of U S A informed about some activities in his homecountry within the birdstrike section of flight safety work; strike reports are treated with the aid of an FAA computersystem operated in Oklahoma City. The Airline Pilots Association has a subcommittee taking care of the bird problems. It was also emphasized that the New York State Port Authority has spent several hundred thousand dollars in order to improve the flight safety situation at Kennedy airport after the DC-10 accident there in the autumn of 1975.

After the enquete about the national committee situation there was a general discussion on the international work in the region concerning the birdstrike problems.

Melville expressed thanks to ICAO for the arrangement of the workshop. Much valuable information and advise had been received. Improved international contacts should certainly become favourable. Perhaps still too early for the establishment of a regional committee. A regional workshop without any help from outside should probably better fit the actual needs of the region.

The representatives of Australia, Brunei and India said that they had the same opinion as Hongkong.

V Ferry thought that the formation of a regional committee rather soon could be mainly of favour for the international co-operation of the region.

P M Peralta of the ICAO Bangkok office expressed a wish that Terms of reference for the formation of a regional committee or other international body should be prepared.

K Wild meant that the BSCE corresponding document could be used as a model for a future committee in this region.

Davidson had the opinion that a regional activity could favourably be started up in a simpler way than by a regional birdstrike committee.

Wong Ah Ngam of Brunei supported the opinion of the Australian delegate. He was also very pleased for the fact that he had now got to know about similar problems in other states as in his homecountry (how to go on with black kites etc).

Melville refered to the preceding contribution about regional exchange of experiences e g concerning the problems with the birds of prey in this area. He should be glad to share with others the experiences made in Hongkong.

The main delegate of Japan wanted to know what kind of equipments that was used in other countries for the dispersal of birds from airports. Type of staff used for this purposed was also of great interest.

Nordlander meant that Melville certainly was a suitable person for these matters and therefore had better take care of this section of the international work.

Davidson and Thorpe expressed their willingness to distribute all type of information about the work going on in their resp countries.

Ferry said that BSCE could also contribute with all type of information available inside the Committee i e in the reports from the annual meetings.

Wilde asked if there were any other specific bird-problems of the region.

Wilkinson here stressed that some parts of the region (outside the Tropics) had also considerable gullproblems.

Wilde underlined that so far no good methods had been developed against kites/hawks.

Y Hoto of Japan informed that in Tokyo the worst bird-problems was caused by gulls.

de Souza, Singapore, declared that specific studies of Kites should be valuable.

Edroma and Davidson had the opinion that all birds of interest for the airport safety had to be studied.

Nordlander expressed the view concerning such typ of studies that ICAO in a state letter should underline the importance of co-operation between museum and aviation authorities.

Davidson supported this opinion and Cheok Hock San of Brunei said that he wanted to suggest a better co-operation with the musum authorities of his country (there was also a representative for Brunei Museum present at the workshop).

L Oriondo, Philippines, suggested that Australia or Hongkong could become the hostcountry for an informal workshop for the region.

A Mohiuddim suggested the workshop to take place in 1980.

Ferry had the opinion that two years was a too long time to wait but Wilde, Wilkinson and Nordlander declared that two years was a reasonable time for preparations.

At this stage of the discussion Wilde made a short summary of the activities during the workshop and called in question how to make future similar workshops better.

Wilkinson assured that the expertise of the workshop certainly was first-rate. However, it's probably an advantage to study to a greater extent the special problems of the region.

Kitakule, Uganda, found the workshop to have been very useful. It was evident, he said, that some delegates had become aware of these problems for the first time.

de Souza and Omar bim Samam wanted more information on the bird problems in Southeastasia.

Mohiuddin was thankful for what he had learnt and promised

to share of his new knowledge in the homecountry.

Hoto declared that they have good information on the birdsituation in Japan. He and his delegation had learnt a lot, he said, and should take it home.

N K Tripathi, India, said that the outcome of the workshop was very valuable for his country.

Melville stressed the same opinion as the represenatatives of Malaysia and Singapore saying that there is a need for more international co-operation about the bird problems of this region.

Ferry was delighted for the fact that this workshop had been possible to bring about.

Cheok Hock San had the meaning that it was a strong wish for a careful discussion of the ird problems of the region. We have to try to avoid bird strikes.

Davidson underlined the importance of the fieldtrip. Another time it will perhaps be possible to demonstrate and discuss types of equipments for this activity.

Wilkinson and Edroma stated the desirability to have as much basic data as possible on the birdsituations in different countries available before a future comference or workshop.

Thorpe asked if somebody could accept to take care of bird strike analysis for this region. Perhaps Australia?

Davidson, Australia, thought this could be possible and also stressed once more the necessity of coming together to discuss related problems.

Montgomery expressed the opinion that even if gulls caused only a minor part of the collisions bird/aircraft in this region they perhaps give rise to the worst damages.

Davidson did not agree with this saying that the gulls of this region are smaller than those of Europe and that multiple strikes with kites also occur.

Discussion on WP:s 10, 11, 12, 14, 25, 27 and 28

All the above enumerated working papers dealt with the activities of working group aerodrome and the evaluation of answers received after the distribution by that group of a questionnaire. The latter had met a very good response from national bird strike committees so that answers from no less than 16 countries had been received.

The chairman expressed the gratefulness of himself and of BSCE for the excellent work that had been carried out by working group aerodrome during the last year.

ADF616119

BSCE/13 AERODROME WORKING GROUP W.P.

Garbage dumps in the Vicinity of Airports

(presented by the Vice Chairman of Aerodrome Working Group)

1. INTRODUCTION

In accordance with a recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

Are there in your country local or/and national regulations which prevent the existence of garbage dumps in the vicinity of airports ?

2. Answers have till April 14, 1978 been received from the following countries:

Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden, Switzerland, United Kingdom, and USA

and are as follows:

Austria:

No regulations. All garbage dumps in the vicinity of the Austrian airports - where existing - have been removed.

Belgium:

No. However, after an investigation called "de commodo et incommodo" the local authorities are able to take a decision for the implantation at this location.Within 10 days an appeal to this decision is possible, e.g. by the airport authorities.

Canada:

Garbage dumps shall not be located on land owned by Transport Canada. On lands surrounding the airport, and not owned by Transport Canada, the local municipal officials shall be made aware of the bird hazards to aircraft associated with garbage dumps. Transport Canada guidelines state that "garbage dumps should not be located within an area contained within a circle having its centre at the airport reference point and a radius of 5 miles".

The Aeronautics Act provides for the enforcement of the above guideline in the event that a garbage dump near an airport causes a bird strike problem.

Czechoslovakia:

There is a national aviation regulation ICAO - Annex 14, generally saying that the airport authority is obliged to do all measures that are necessary for bird reduction at airports and their surroundings. In 1976 and 1977 there were worked out regulations and instruction within our airports comprising concrete measures and methods how to reduce existing birds at airports and food resources for birds; these regulations also ban the existence of garbage dumps in the vicinity of airports.

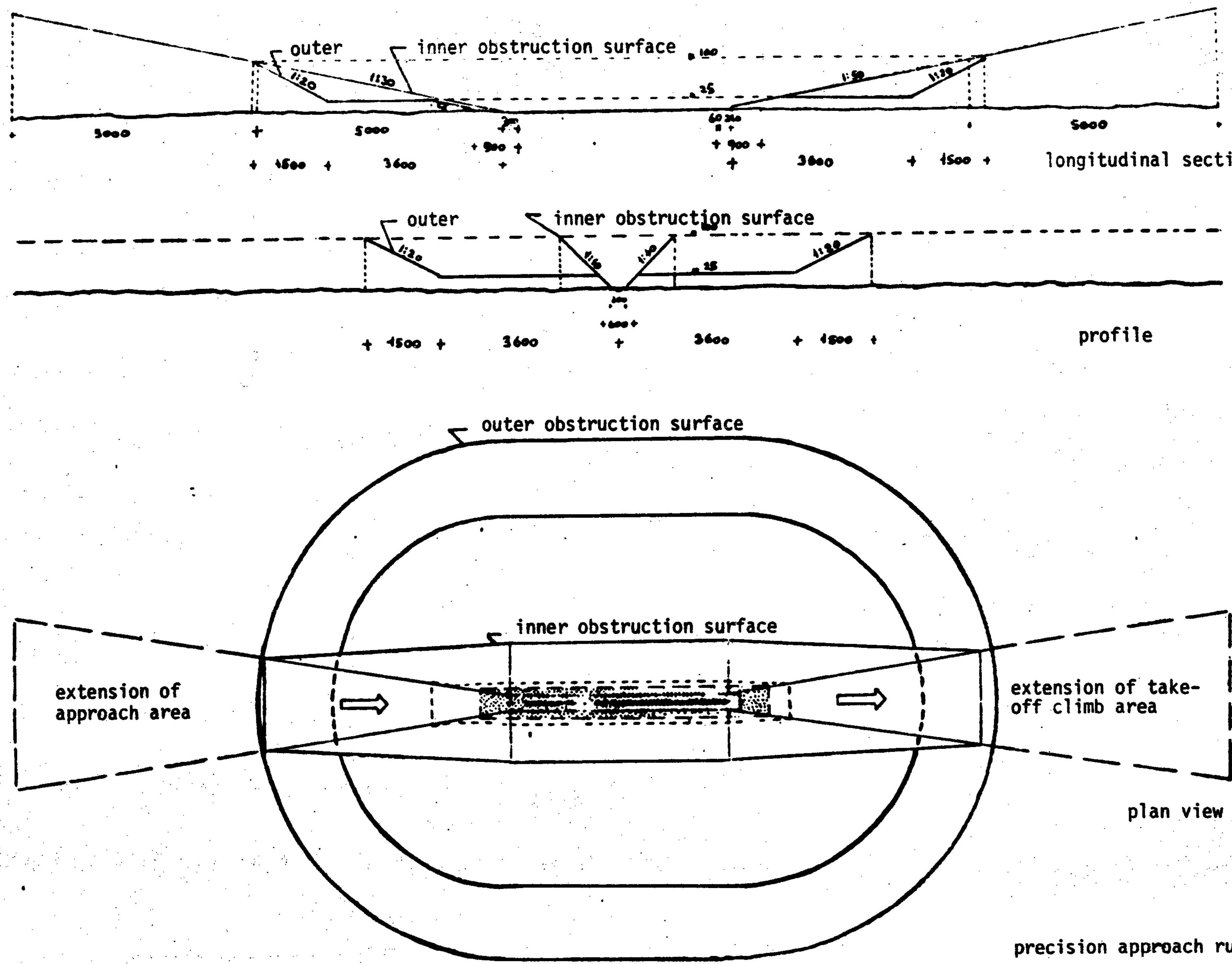
Denmark:

Although there are no regulations, there are legal ways in the Community Planning Act to prevent installation of new garbage dumps, either by dealing directly with the local authorities or through the Ministry of Planning,and existing dumps may be removed by expropriation.

In a circular issued by the Ministry of Environment and Planning of August 1977 to all communities it is, however, stated that garbage dumps should not be installed less than 6.5 km from airports or aerodromes or in such a way that overflying will take place between the dump and the hatching place.

The Federal Republic of Germany:

According to "Regulations for the Prevention of Collisions between birds and aircraft" issued on February 13, 1974, by the Ministry of Transport there shall be no waste areas or garbage dumps or compost places etc., which could attract birds or other animals on the airport ground. In the vicinity of airports it should be tried to remove already existing garbage dumps on the ground below the inner and outer obstruction surface and on the surface of the landing and take-off areas extended by 5 km as shown below and the installation of new waste places should not be permitted



precision approach runway

France:

A circular from the Ministry of the Interior asks the Prefects to inform the mayors in the neighbourhood of airports of the bird strike risks connected with the existence of garbage dumps in the neighbourhood of airports and further asks them to move these garbage dumps when the airport authorities deem it necessary.

Hungary:

No such regulations exist.

Israel:

Except for regulations preventing bird hazards we do not have specific regulations against garbage dumps in the proximity of airports.

The Netherlands:

There is no regulation in the Netherlands that prevents existence of garbage dumps in the vicinity of airports. There are legal ways of protesting against the installation of new garbage dumps, and there are ways of coming to an agreement with the local authorities to remove existing dumps either by dealing directly with the local authorities or through the appropriate Agency of Civil Aviation Department.

Poland:

No regulations.

South Africa:

No. We do have, however, the fullest co-operation from local authorities, municipalities, provincial administrations, etc. and have had no difficulty up to the present in preventing the establishment of garbage dumps near airports, or in having offending dumps removed.

Sweden:

There are no local or/and national regulations in Sweden which prevent the existence of garbage dumps in the vicinity of airports. However, according to the Building Law (for building works and other types of establishment) new constructions are not allowed to be located in a way that they interfere with earlier establishments and activities originating from them.
Furthermore, the location of an establishment for refuse has to be examined by a Board of Powers for the protection of the environment. If the establishment is proposed to be located within 8 miles radius of an airport the Board of Civil Aviation of Sweden has always the right to

declare its opinion about the flight safety risks depending on possible anticipated concentrations of birds or/and future flying routes of birds. The Board of Powers has during the last few years started to consider our opinions very seriously. One year ago it prohibited a municipality to locate an establishment for refuse (of the type garbage dump) near the Kristianstad/Everöd airport in the most southern part of Sweden. The municipality of Kristianstad protested against the decision and recently the Government of Sweden, Department of Agriculture, has dissolved the verdict and admitted the localization of the establishment but under very rigid conditions: "It must be a compost establishment and all handling of garbage (grinding and intensive composting etc.) has to be performed in a way that no birds can be attracted to the establishment". We construe this decision as if the handling of garbage must be done under roof and we look upon the verdict as prejudicing for future, similar cases. - Such types of establishments are not garbage dumps so therefore we are in fact in the same situation as if garbage dumps were prohibited in the vicinity of airports.

Switzerland:

In a regulation issued by the Swiss Office for the Protection of Environment there is a paragraph requesting consultation of the Swiss Air Office in case of garbage dumps in the vicinity of airports indicating that such dumps should not be established in the vicinity of airports without consultation with the Swiss Air Office. This paragraph may, if necessary, also be applied in case of existing garbage dumps. Yet, these regulations are not part of a law, but only part of an official guideline; thus they are open to discussion and agreements in each case.

United Kingdom:

There are no national or local regulations in U.K. which prevent the existence of garbage dumps in the vicinity of airports. The "Town and Country Planning (Aerodromes) Direction, 1972" requires local authorities to consult with our Civil Aviation Authority (CAA) concerning development of land within designated areas on or around aerodromes. This covers various bird attractive developments, such as garbage dumps within approximately 7 miles radius of the airport. The CAA would obviously strongly advise against any development, but under some circumstances the advice could be overruled.

USA:

There are no national regulations to prevent the existence of garbage dumps or sanitary landfills in the vicinity of airports. The primary guidance

that the Federal Aviation Administration (FAA) has regarding such landfills is contained in an internal FAA Order 5200.5.

According to this order sanitary landfills will be considered as an incompatible use if located within areas established for the airport through the application of the following criteria:

a. Landfills located within 10,000 feet of any runway used or planned to be used by turbojet aircraft.

b. Landfills located within 5,000 feet of any runway used only by piston type aircraft.

c. Landfills outside of the above perimetres but within the conical surfaces described by FAR Part 77 and applied to an airport will be reviewed on a case-by-case basis.

d. Any landfill located such that it places the runways and/or approach and departure patterns of an airport between bird feeding, water, or roosting areas.

The Agency does not have the regulatory power to prohibit the construction of such landfills outside the jurisdiction of the airport management. There are severeal states that have or are in the process of passing State Requirement concering the placement of such fills near airports. The Environmental Protection Agency (EPA) of the U.S. Government currently is considering a federal regulation that would adopt as a regulatory requirement the criteria in the above identified order. This is still in the notice of proposed rulemaking stage and we have no indication of its final dispositon.

3. Three courses of action should be considered by the Aerodrome Working Group.

a) Due to the differences in the local conditions at each airport and each country, no recommendation should be made and the problem be left in abeyance after the above material has been made available to the competent authorities.

b) A recommendation from the meeting should be worked out.

c) Based on the discussion on the Working Paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the Working Group for approval.

BSCE/13 AERODROME WORKING GROUP WP

Homing Pigeons in the Vicinity of Airports

(presented by the Vice Chairman of the Aerodrome Working Group)

1. INTRODUCTION

In accordance with the recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

Are there in your country local or/national regulations which prevent racing of homing pigeons in the vicinity of airports ?

If yes, indicate the regulations and give information as to what legal measures can be taken against existing homing pigeons etc. in the vicinity of airports.

2. Answers have till April 14, 1978 been received from the following countries: Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden Switzerland, United Kingdom, and USA and are as follows:

Austria:

No regulations. Homing pigeons are met very seldom in Austria.

Belgium:

No.

Canada:

There are no regulations which prevent the racing of homing pigeons near airports

Czechoslovakia:

In Czechoslovakia there are no regulations that would prevent racing of homing pigeons in the vicinity of airports. For holding such a race it is sufficent to get a permission from the owner of the ground.

Denmark:

There are no regulations which prevent the racing of homing pigeons near airports. The existence of that kind of bird species is, however, recognized as a hazard to aircraft. On October 3, 1976 a Boeing 727 had a collision with a flock of pigeons resulting in the total damage of one engine. The Airports Authority of Copenhagen Airport where the bird strike took place, has urged the Danish Homing Pigeons' Association to request their members to keep the pigeons away from the airport, possibly by suitable feeding as it has been indicated from biologists that there is a possibility to feed pigeons in such a way that they do not need to forage in the open to be able to cover the need for the different nutrience.

The Federal Republic of Germany:

According to the "Regulations for the Prevention of Collision between birds and aircraft", issued on February 13, 1974, by the Ministry of Transport, pigeons should not be kept on the airport ground and preventive measures should be taken that no pigeons fly within the area below the inner obstruction surface. At present, however, there are no legal remedies in the Federal Republic of German to forbid that pigeons are kept in the vicinity of airports. Take-off by a DC-8 SWISSAIR aircraft was interrupted on January 18, 1978, at Hamburg Airport. Pigeons colliding with the aircraft were responsible for this interruption. Meanwhile, the Council of Hamburg has made efforts to prohibit the existence of pigeons in the vicinity of airports on the same lines as those laid down by the Ministry.

France:

It is forbidden to send up homing pigeons at French airports according to a regulation concerning homing pigeons of 22nd April, 1958 without permission of the Airport Authorities. On the other hand, there is at present no regulation saying that it is forbidden to have breeding of domestic or homing pigeons in the vicinity of airports.

Hungary:

No such regulations exist.

Israel:

We have no specific regulations or laws regarding homing or racing pigeons in the vicinity of airports.

The Netherlands:

No national or local regulations prevent the racing of homing pigeons. Consequently, no legal measures can be taken. However, homing pigeons do not seem to create a specific hazard at Schiphol Airport.

Poland:

It is not allowed to breed and race pigeons in the radius of ca. 5 km. Owners of pigeons should fined by municipal authorities, but it is not always executed.

South Africa:

No. We have, to date, experienced no difficulty from racing pigeons activity.

Sweden:

There are in Sweden no regulations preventing the racing of homing pigeons. So far, we have, however, had no or very little difficulties for the air safety with homing pigeons.

Switzerland:

There are no regulations which prevent racing of homing pigeons or the establishment of a pigeon loft in the vicinity of an airport. Yet, having no problems with racing pigeons at the moment and seeing no increase in the attractivity of this hobby in Switzerland, we see no necessity of regulations.

United Kingdom:

There are no legally binding regulations, but there is a satisfactory informal agreement with the Royal Pigeon Racing Association whereby at specific, busy aerodromes all releases are banned within 7 miles' radius. Also Air Traffic Control (ATC) at other aerodromes are notified 14 days in advance of impending releases likely to affect them. This agreement is reviewed annually, but to date has worked well.

USA:

We have no regulations regarding the racing of homing pigeons in the vicinity of airports.

3. Three courses of action should be considered by the Aerodrome Working Group.

a) Due to the differences in the local conditions at each airport in each country, no recommendation should be made, and the problem be left in abeyance after the above materiel has been made available to the competent authorities.

b) Recommendation from the meeting should be worked out.

c) Based on discussion on the working paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the working group for approval.

ADF616121

BSCE/13 AERODROME WORKING GROUP WP

Use of Land in the Vicinity of Airports

(presented by the Vice Chairman of the Aerodrome Working Group)

1. INTRODUCTION

In accordance with the recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

Are there any regulations that prevent the use of land within a certain distance from any runway ?

If yes, give any details, and indicate what legal measures you have to bring such a use of land to an end.

2. Answers have till April 14, 1978 been received from the following countries: Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden, Switzerland, United Kingdom, and USA
and are as follows:

Austria:

No regulations. The airport operators initiate measures with due regard to local circumstances and interest of competent authorities.

Belgium:

Civil Airports: The zones of 150 m from the centre line of each runway and 60 m over both ends of each runway may not be used for agriculture.

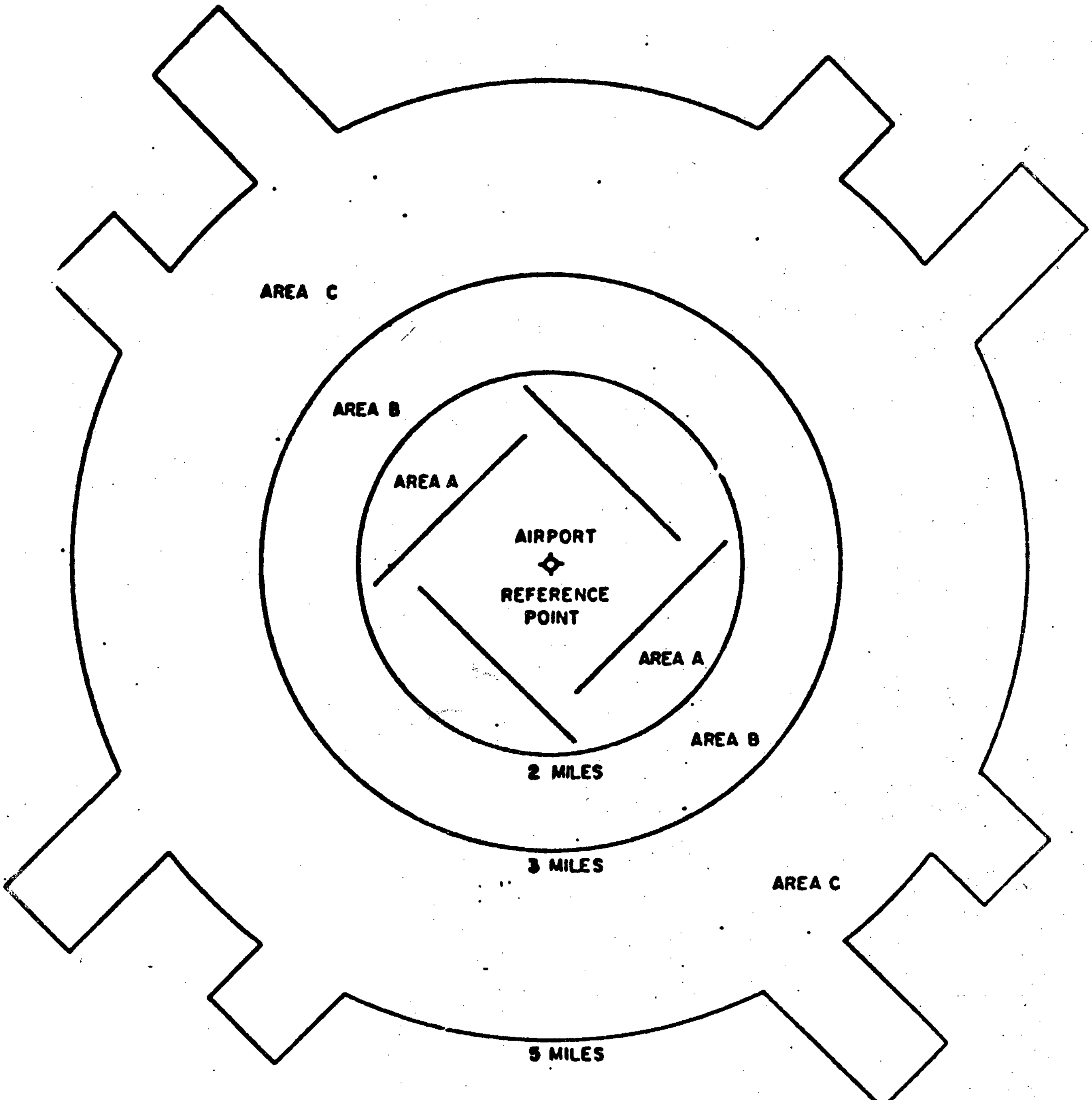
Military airports: The farmers have to follow for each airport the recommendation given by the military authorities, e.g. choice of cultures, working periods, and times, etc.

Canada:

The standards and guidelines contained in WP/12 to BSCE "Planning and Control of Bird Hazards' Reduction at airports in the Transport Canada System" are at pre-

sent the only land use regulations and forced on Transport Canada owned land to reduce the number of bird strikes to aircraft at Canadian airports.
The Bird Hazard Avoidance Standards used in planning the zoning of land or the periphery of new airports are shown on the below fig.

BIRD HAZARD AREAS



These standards were used in the planning of Mirabel International Airport and Edmonton (Villeneuve) Airport which are recently constructed Canadian airports.

In addition to providing these standards as constraints to our planners, we asked Dr. Solman to review proposed building designs from the stand-point of avoidance of Bird Hazards. In the case of Mirabel Airport the initial building design had to be completely revised because Dr. Solman was able to convince us that it would have constituted an extremely dangerous bird hazard.

LAND USE STANDARDS

	ALLOWABLE LAND USE		
Land Use (Note 1)	Area A	Area B	Area C
NATURAL			
coniferous forest reserves (Note 2)	Yes	Yes	Yes
deciduous forest reserves	No	No	Yes
fish reserves	No	No	Yes
bird sanctuaries	No	No	No
swamp land	No	No	No
flood and flood control areas	No	No	No
game preserves	No	No	No
AGRICULTURAL			
landscape nurseries (Note 2)	Yes	Yes	Yes
tree farming (Note 2)	Yes	Yes	Yes
stock farming (Note 3)	Yes	Yes	Yes
dairy farming (Note 3)	Yes	Yes	Yes
sod farming	No	No	Yes
seed farming	No	No	Yes
crop farming	No	No	Yes
piggeries	No	No	No
fruit tree farming	No	No	No
stock feedlots	No	No	No
stockyards	No	No	No
fur farms	No	No	No

NOTE No. 1 In the case of international airports, radius of the circles delineating Area A and B should be increased by one mile. Because of the length and orientation of runways at these sites, runways will be further protected by mile wide corridors extending five miles from runway ends. Where these corridors project beyond the five mile circle, the area will be designated as "C". Caution should be exercised to prevent incompatible uses from being located on both sides of these projections to discourage bird traffic from crossing these areas.

NOTE No. 2 Provided the method of management does not create or maintain bird populations which create hazards to aircraft safety.

NOTE No. 3 Provided feed is not accessible to birds and that precautions are taken to ensure that the disposal of excrement does not attract birds.

LAND USE STANDARDS

	ALLOWABLE LAND USE		
Land use	Area A	Area B	Area C
RECREATIONAL			
golf courses (Note 4)	Yes	Yes	Yes
parks (Note 4)	Yes	Yes	Yes
playgrounds (Note 4)	Yes	Yes	Yes
athletic fields (Note 4)	Yes	Yes	Yes
riding trails (Notes 3, 4)	Yes	Yes	Yes
tennis, lawn bowling (Note 4)	Yes	Yes	Yes
picnic and camp grounds	No	Yes	Yes
riding academies	No	No	Yes
racetracks	No	No	Yes
fair grounds	No	No	No
outdoor theatres	No	No	No
COMMERCIAL (Notes 4, 5)			
offices	Yes	Yes	Yes
retail sales	Yes	Yes	Yes
hotels and motels	Yes	Yes	Yes
restaurants	Yes	Yes	Yes
parking lots	Yes	Yes	Yes
indoor theatres	Yes	Yes	Yes
warehouses	Yes	Yes	Yes
shopping centres	Yes	Yes	Yes
service stations	Yes	Yes	Yes
cemeteries	Yes	Yes	Yes
drive-in restaurants	No	No	Yes

NOTE No. 3 Provided feed is not accessible to birds and that precautions are taken to ensure that the disposal of excrement does not attract birds.

NOTE No. 4 Provided areas are kept clean and free of box lunch remains, restaurant garbage and other waste edible to birds.

NOTE No. 5 Flat roof buildings which may, by design or by accident, retain water on their surface, are not recommended within Area A unless the water is not accessible to birds.

LAND USE STANDARDS

Land Use	Area A	Area B	Area C
	ALLOWABLE LAND USE		
INDUSTRIAL (Note 5)			
quarries (if seldom worked, abandoned and containing water)	No	No	No
food processing plants	No	No	Yes
manufacturing facilities	Yes	Yes	Yes
MUNICIPAL UTILITIES (Note 5)			
sanitary landfill	No	No	No
garbage disposal	No	No	No
sewage treatment	No	No	No
water treatment	Yes	Yes	Yes
water storage (reservoirs)	No	No	No
TRANSPORTATION			
highways	Yes	Yes	Yes
railroads	Yes	Yes	Yes
port facilities	No	No	No

NOTE No. 5 Flat roof buildings which may, be design or by accident, retain water on their surface, are not recommended within Area A unless the water is not accessible to birds.

Airport Operational Standards for Bird Hazard Control

Another responsibility for Ottawa Headquarters Management (i.e. Corporate Management) is to publish airport operational standards which serve as controls on airport site management. Again our Operational Standards for Bird Hazard Control are based on the 76 Research reports published by the National Research Council Associate Committee on Bird Hazard to Aircraft. The contents of these Airport Operational Standards are as follows:

Operational Standard No. 1 — Land Within 1200 Feet of Runway and Within Infield Areas

Any land within 1200 feet of any runway centre line, or runway end, and within infield areas, shall not be used for the growing of oats, corn, sunflowers, rye, barley, wheat and other cereal crops, market garden crops, fruit bearing trees or plants. Hay, clover, or alfalfa may be grown in this area, except at those airports where the annual bird strike rate is greater than five strikes a year.

Operational
Standard No. 2 Land Within 1200 Feet of Runways

Any land which is within 1200 feet of any runway centre line or runway end, and within infield area, shall not be used for the grazing of beef or dairy cattle, or for feedlots for cattles, pigs, sheep, or other animals, and such land shall not be used for sod farming, fur farms or stock-yards. Hay, clover, or alfalfa may be grown in this area except at those airports where the annual bird strike rate is greater than five strikes a year.

Operational
Standard No. 3 Land Within 500 Feet of Runways

No trees shall be allowed on land within 500 feet of runway centre lines, nor on land within 500 feet of runway ends.

Operational
Standard No. 4 Plowing Land on Airport Property

No plowing of land on one side of a runway shall be allowed within 24 hours of plowing of land on the other side of the runway.

Operational
Standard No. 5 Leases and Grass Height Within 1200 Feet of Runways

For those airports where the average number of bird strikes over the previous five years is greater than five strikes a year

a) there shall be no agricultural leases for the use of land within 1200 feet of runway centre lines or runway ends.

b) for land within 1200 feet of runway centre lines or runway ends, the grass should be kept free of weeds and should be maintained between 5" and 7" high. The grass may be maintained lower than 5" where small birds are not a problem.

Operational
Standard No. 6 Agricultural Lease Contracts

The restrictions contained in Operational Standards No. 1, 2, 3, and 4 must be included in any agricultural lease contracts covering any part or all of the land referred to in those operational standards.

Operational
Guideline No. 1 Flattening of Drainage Ditch Slopes

Drainage ditches with banks too steep to allow for regular cutting of grass cover by airport grass-cutting equipment should be graded to a 4 to 1 slope and maintained with grass cover.

Operational
Guideline No. 2 Elimination of Water Bodies

Grading and earthwork should be undertaken to eliminate all bodies of water within the airport boundaries.

Operational
Standard No. 7 Sewage Lagoons

In cases where there is no municipal sewage system to connect with, sewage lagoons may be constructed within airport boundaries. In such cases, they shall not be located within 1200 feet of either runway centre lines or runway ends.

Operational
Standard No. 8 Cleaning of Drainage Ditches

Drainage ditches shall be cleaned periodically so that water flow shall not be impeded.

Czechoslovakia:

A regulation of the Ministry of Agriculture and Food states conditions about hunt in hunting grounds at the airport areas; it also modifies legal relations between the airport authority and the user of hunting. If airports belong to non-hunting grounds, the airport authority is obliged to ask for a permission to shoot exceptionally animals at the airport (keeping the law No. 23/62). The areas in the vicinity of runways are used for growing grass.

Denmark:

Military Airports: The zones of 600 m from the border of the runway may not be used for agriculture. Exceptions have been made for private owned land to a distance of 300 m from the border of the runway.

Civil Airports: The Civil Aviation Authorities have issued no regulations, but try to persuade the local airport authorities to buy up land in order to lay it out in zones of 600 m (for smaller airports 300 m) from the border of the runway.
As the licence to operate a non-state owned airport shall be renewed every year, the Civil Aviation Administration has within its power to make renewal of the licence conditional on establishment of zones that may not be used for agriculture.

The Federal Republic of Germany:

Unfortunately, there are no regulations that confine the agricultural use of land in the vicinity of airports. Should the occasion arise, the parties involved will try to come to terms directly. In the very airport area agricultural and horticultural use of land are not allowed. Civil airports act in conformity with this prohibit, too.

France:

Certain cultivations and methods of cultivation are forbidden or at least very inadvisable according to the below catalogue:

LIST OF CULTIVATIONS ATTRACTIVE AND NON-ATTRACTIVE TO BIRDS

NON-ATTRACTIVE (ADVISABLE)	LESS ATTRACTIVE	VERY ATTRACTIVE (INADVISABLE)
Most of the cultivations to be weeded, i.e.: - beet: turnip, sugar beet - potatoes - outdoor carrots - turnip (cattle feeding) - celery - tomato - radish - asparagus - swede - leek Inedible seeds and fruits - tended cultivations other than for the pleasures of the table - flax, line - soya bean	- Spring wheat - Spring barley (winter barley) - rape - lucerne, alfalfa - oat (treat the seeds with anthraquinone choose the dwarfish sorts of wheat and barley)	- Winter wheat - Winger barley (especially, when these sorts are lodged by wind, storm ...) - lupin - corn - peas - cabbage - clover - mustard, vetches - beans, horse beans - one-grained wheat, radish for feeding - salade - millet (Panicum miliaceum,) - millet (Panicum germanicum) - sunflower - sorghum - buckwheat
Other possibilities: - Flower cultivations - Horticulture, laurels, thuja		
- Lawns with grass seeds only		- Lawns with half grass seeds and half clover seeds

193

Usually, the airport manager submits a plan of recommended cultivations to the competent authorities who approve or modify the plan after having considered carefully the local rate of bird hazards. This rule applies only to areas belonging to airports.

Only grass-cutting and appurtenant gleaning, as occasion requires, is allowed up to 75 m from the centre line of the runway and up to 25 m from the centre line of taxiways; it is possible to cultivate certain low plants between this limit of 75 m and up to 150 m from the runway centre line; other exploitations of the soil are allowed outside (ornamental bushes bearing no berries, having formation of seeds, having no connection with horticulture, etc.).

Hungary:

Land use control only in respect of obstacles.

Israel:

We have specific laws that enjoin proper care of the land within the area of airports. According to this law, only the Director of the airport is authorized to issue a permit for the use of the land to outsiders. The conditions over there are that farmers have so far received permits to farm the land, and it is difficult today to prevent them from doing so, or to force them to grow specific agricultural crops, since there are other government authorities involved that strongly protect these farmers.

The Netherlands:

There are no regulations that prevent the use of land within a certain distance from the runway in respect to the bird strike problem. At Schiphol the area of approximately 500-1000 m at each end of the runway is property of the airport as is the land on 500-1000 m on each side of the runway.
In these areas any desirable bird reducing measure can be taken.

Poland:

No general regulations.

South Africa:

The provincial authorities have powers to zone land usage in accordance with proclaimed noise contours around airports. In addition local authorities can control the use to which land in the areas under their jurisdiction is put in accordance with town-planning principles. The civil aviation authority is thus dependent on the authorities mentioned above for influencing land use.

Sweden:

There are in Sweden no regulations preventing the use of land within a certain distance from any runway. Yet some of the "Operational Standards" included in WP/12 to BSCE on bird hazards to aircraft are fulfilled. The Swedish Board of Civil Aviation owns in most of its airports a considerable area of land outside the 500 feet boundary line from the runway centre lines and farming is permitted there only in "non sensitive areas" and accordingly agricultural lease contracts stating that some crops attractive to birds are not permitted.

Switzerland:

Military airfields:
In the cases where the Military Department is the owner of the land there are new regulations with the following main points:

- no sheep grazing within 150-200 m on both sides of the runways
- grass to be kept longer than 10-12 cm within these stripes
- no natural fertilizer within the confines of the airport. When necessary is fluid natural fertilizer allowed from 1600 hrs or on Saturdays.

Zürich Airport:

- agricultural use of land is forbidden within 50 m on both sides of the runway and in a narrow stripe of final approach to each runway.
- long-term contracts with the farmers will successively be altered in order to prevent sheep grazing and growing of cereals within the confines of the airport.

United Kingdom:

There are no national or local regulations in U.K. which regulate the use of land in the vicinity of airports. The "Town and Country Planning (Aerodromes) Direction, 1972" requires local authorities to consult with our Civil Aviation Authority (CAA) concerning development of land within designated areas on or around aereodromes. Where the "Local Planning Authority" and CAA cannot agree on land usage proposal, an inquiry could result leading to a Ministerial decision concerning the land usage.

USA:

Presently there are no regulations regarding the use of land in the vicinity of airports as contained in the Canadian Publication WP-12.

3. Three courses of action should be considered by the Aerodrome Working Group.

a) Due to the differences in the local conditions at each airport in each country no recommendation should be made, and the problem be left in abeyance after the above material has been made available to the competent authorities.

b) A recommendation from the meeting should be worked out.

c) Based on the discussion on the Working Paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the Working Group for approval.

BSCE/13 AERODROME WORKING GROUP WP

Length of the Grass Along the Runways

(Presented by the Vice Chairman of the Aerodrome Working Group)

1. INTRODUCTION

In accordance with the recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

What is your position regarding the question of length of the grass along the runways, and indicate especially if you allow the grass to grow long right up to the runway ?

2. Answers have till April 14, 1978 been received from the following countries: Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden, Switzerland, United Kingdom, and USA
and are as follows:

Austria:

Grass length is kept as short as possible to a maximum of 6-40 cm.

Belgium:

Civil Airports: The grass should be grown long right up (± 20 cm) over the airport as much as possible, especially on the manouevring areas adjacent to:

a) within the graded area of a runway strip (150 m on each side of the centre line).

b) within the graded area of a taxiway strip (38 m on each side of the edge of the taxiway).

Military Airports: There are three zones:

a) Zone 1: 2 m from the edge of the runways and taxiways short grass.

b) Zone 2: From Zone 1 until 30 m from the edge of the runway and 15 m from the edge of taxiway long grass with a minimum height of 20 cm. This grass will be cut once or twice a year.

c) Zone 3: Rest of airfield: Several prescriptions individual for each airport.

Canada:

Transport Canada Standards require the length of grass to be maintained at 5 inches to 7 inches within 500 feet of the runway centre line.

Czechoslovakia:

A recommended length of the grass at the airport area (especially, in the strip) is 15-25 cm. The grass is mowed four times in one year. In other adjoining areas the length of the grass can be about 40 cm. We do not allow the grass to grow up to the joints in the runways and taxiways.

Denmark:

There is a requirement to the effect that the length of grass to be maintained at 15-20 cm all over the airport and right up to the runways. Exceptions are made in the vicinity of airport lights situated in grass areas.

The Federal Republic of Germany:

The question of the length of grass at a civil airport depends on the judgement of the biotop expertise required in accordance with the guidelines. In no circumstances will we accept the required grass length to grow right up to the runway. The grounds for this judgement are as follows: Danger of fire, especially in the autumn, and danger of having low instruction signs and airport lights overgrown with weeds.

/ . . .

France:

For safety reasons (dager of fire), for lack of adequate equipment, and due to cost-consuming maintenance, it is very often impossible to have the grass in the grass zones kept at the height recommended by ICAO (23 cm). Most of the time the grass is cut very short (5-6 cm) 5 or 6 times a year by a special lawn-mower; gleaning of the grass is only made at well-equipped airports.

Hungary:

Grass is generally cut short on the whole area of the airport.

Israel:

We have specific laws that enjoin proper care of the land within the area of airports. According to this law, only the Director of the airport is authorized to issue a permit for the use of the land to outsiders. The conditions over there are that farmers have so far received permits to farm the land, and it is difficult today to prevent them from doing so, or to force them to grow specific agricultural crops, or the grass at a specific length, since there are other government authorities involved that strongly protect these farmers.

The Netherlands:

At Schiphol the area of 50 m at each side of the runway and 500-1000 m at each end of the runway is covered with grass. The grass is kept long, the minimum cutting height is 25-30 cm.

Poland:

No experiences.

South Africa:

The policy is to keep the grass short although experiments with longer grass have been carried out with inconclusive results.

Sweden:

We have no national recommendation concerning length of grass in an airport. The routines are different in different places, but they do not cut the grass short in airports where this method will favour the local bird population. In the Swedish book "Fåglar och flyg" (birds and aviation) a lower grass length of 15-20 cm is recommended.

Switzerland:

Military airfields: In the case where the Military Department is the owner of the land there are new regulations with the following main points:

- grass to be kept longer than 10-12 cm within 150-200 m on both sides of the runways.

United Kingdom:

Long grass is recommended as a bird deterrent at aerodromes with paved runways. Grass within 5 metres of such runways should not be longer than 10 cm, but elsewhere a maximum length of 20 cm is suggested, however specialist advice is recommended before adopting a long technique at specific airports. This is considered in paras 4.3 and 4.4 of a document issued by CAA to UK airport operators entitled "Bird Control on Aerodromes" ref CAP 384.

USA:

Federal requirements do not address the question of proximity or length of grass adjacent to runway surfaces. Grasses and other forms of vegetation that are likely to attract birds are not recommended near runways. Airport operators are encouraged to work with local and state wildlife personnel to avoid landscaping that might attract birds and other wildlife.

3. Three courses of action should be considered by the Aerodrome Working Group.

a) Due to the differences in the local conditions at each airport in each country, no recommendation should be made, and the problem be left in abeyance after the above material has been made available to the competent authorities.

b) A recommendation from the meeting should be worked out.

c) Based on the discussion on the Working Paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the Working Group for approval.

ADF616/22

BSCE/13 AERODROME WORKING GROUP WP

Sanctuaries in the Vicinity of Airports

(presented by the Vice Chairman of the Aerodrome Working Group)

1. INTRODUCTION

In accordance with the recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

Are there in the vicinity of your airport sanctuaries where it is not allowed to carry out the measures considered necessary to secure aviation safety ?

2. Answers have till April 14, 1978 been received from the following countries: Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden, Switzerland, United Kingdom, and USA
and are as follows:

Austria:

No.Aviation safety measure can always be taken.

Belgium:

Civil Airports: No.

Military Airports: For one airport there is a sanctuary at about 5 km from the boundary of the airport.

181

Canada:

Transport Canada Standards and Guidelines can only be enforced on land owned by Transport Canada. However, if a sanctuary (or any land use) on land not owned by Transport Canada is creating a serious bird strike problem, a regulation can be promulgated under the Aeronautics Acts which would give Transport Canada the power to have removed any serious threat to aviation safety.

Czechoslovakia:

In the vicinity and surroundings of the airport Prague-Ruzyne there are Nature Reserves "Sårka" and "Hvezda", where the measures on the protection of freely living animals are valid.

Denmark:

Attempts are made to reduce and control the breeding population of the hering gull near Copenhagen Airport. As part of control programme it is considered necessary to reduce the rate of reproduction in hering gull colonies of two bird sanctuaries on the Swedish side of Øresund, but so far permission by Swedish owners and authorities could not be obtained.

There are no sanctuaries in the immediate vicinity of the military airports, nor the provincial civil airports. The shortest distance of the runway to a sanctuary for military airports is 12.5 km and for provincial civil airports 3 km.

If, however, a sanctuary in Denmark is creating a serious bird strike problem, regulation could be promulgated under the Aeronautics Act which would give the Civil Aviation Authority the power to have removed any serious threat to aviation safety.

The Federal Republic of Germany:

If there happen to be sanctuaries in the vicinity of an airport, the airport authority can take measures considered necessary to prevent congregations of birds.

France:

In France there are no airport situated in the immediate vicinity of bird sanctuaries. If that case should arise, there are no legal wording which would make it possible to intervene for the benefit of aviation safety.

Hungary:

There are no sanctuaries in the vicinity of Ferihegy Aerodrome.

Israel:

The reply is negative.

The Netherlands:

There are some sanctuaries a few miles from the airport. No bird reducing measures could be taken there so far.

Poland:

I do know such examples.

South Africa:

Not at the moment, but difficulties could arise in the future. We would then call upon the local authority concerned to take whatever measures were in their power.

Sweden:

Only in one case there is a shallow lake at a distance at about 1 km from an airport with a rich bird life, and which is sanctuary. However, measures have not been considered necessary there.

Switzerland:

No sanctuaries in the vicinity of military airports.

Zürich Airport:
There are sanctuaries in the immediate vicinity and partly within the confines of the airport, but they are not more attractive for the most problematic bird species (gulls and birds of prey) than the cultivated land. If necessary, special permission for the dispersal of the most dangerous species can surely be obtained.

United Kingdom:

There are no bird sanctuaries near UK aerodromes so, to date there is no UK problem. Such proposals would come under the consultative procedures in the "Town and Country Planning (Aerodromes) Direction, 1972" according to which local authorities are asked to consult with our Civil Aviation Authority (CAA). Existing UK Bird Protection laws do not take account of the need to safeguard aviation from bird hazards. The CAA is making representations to the UK Government on this issue.

USA:

In the carrying out of the bird reduction programs on an airport or in the vicinity of bird sanctuaries, it is necessary for those conducting the programs to clear their action with the U.S. Fish and Wildlife Service and various other local and national wildlife preservation organizations.

3. Three courses of action should be considered by the Aerodrome Working Group.

a) Due to the differences in the local conditions at each airport in each country no recommendation should be made, and the problem be left in abeyance after the above material has been made available to the competent authorities.

b) A recommendation from the meeting should be worked out.

c) Based on the discussion on the Working Paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the Working Group for approval.

1821

ADF616124

BSCE/13 AERODROME WORKING GROUP WP

Trees and Bushes in the Vicinity of Airports

(presented by the Vice Chairman of the Aerodrome Working Group)

1. INTRODUCTION

In accordance with a recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

Are there in your country regulations regarding the existence of trees and bushes in the vicinity of airports ?

If yes, give all details.

2. Answers have till April 14, 1978 been received from the following countries: Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden, Switzerland, United Kingdom, and USA

and are as follows:

Austria:

No regulation.

Belgium:

No.

Canada:

Trees and bushes are to be removed from the areas within 500 feet of the runway centre line.

Czechoslovakia:

The internal regulation states methods how to reduce the possibility of freely living animals hazards in the airport area. The regulation also orders to realize a maximum restriction on natural shelters, vast leafy-tree woods and bushes in the vicinity of runways.
Another regulation modifies conditions for a special maintenance of the ground radio and communication facility protection areas for civil aviation.

Denmark:

There are no regulations regarding the existence of trees and bushes in the vicinity of airports outside the airport area. On the military airports trees and bushes have been removed in a distance of 600 m from the runway; on the provincial civil airports in a distance of 50-300 m from the runway.
At the southern border of the Copenhagen Airport a stand of spruce is to be found 1500 m from the nearest runway. The trees are making an environmental protecion lessening the noise and smell for the neighbours.
Sometimes, however, flocks of starling settle in the trees, and must be dispelled.If the starlings give motivation to dispose of the trees from the airport area, the birds would settle outside the border, but the distance to the runway would be only 50 m longer. In this situation it is not possible to dispel the birds, and the neighbours would get greater inconveniences from the airport. As the birds which stay in the tree area presumably are not a hazard to the traffic on the runways, the airport authority decided to keep the spruce standing. In general the airport authority wants - with regard to environmental protection - to keep the trees around the airport and has therefore kept solitary trees even though the distance to the runway is only 300 m.

The Federal Republic of Germany:

There are no general regulations regarding the existence of trees and bushes outside the airport owned area. Should, however, due to judgement of the local biotop expertise, the occasion arise, it is possible to take measures to have the trees and bushes removed.

France:

Wild bushes and trees are extremely rare at airport areas. They are cut down if they serves as resort for nesting and resting birds. The below list of trees and bushes attractive to birds has been distributed to the chiefs of airport:

- barberry (all species)
- Oregon grape (Mahonia aquifolium)
- Virginia creeper (all species)
- Holly (Ilex acquifolium)
- Bushes and trees of the rose family (Rosaceæ) bearing the below berries and fruits:
  * blackberry and raspberry
  * bird cherry
  * plums
  * sloe (blackthorn)
  * mountain ash, rowan
  * sallow (Sorbus svecica)
  * hawthorn
  * cotoneaster (crataegus pyracantha)
  * cherry laurel
  * cotoneasters
  * ivy
  * elder
  * strawberry-tree
  * yew
  * juniper berry

Hungary:

The presence of trees and bushes is controlled by obstacle restriction consideration.

Israel:

We have regulations controlling any elevated objects or constructions in the vicinity of airports. Any such object, including shrubs and trees, requires a permit of the Civil Aviation Authority, which imposes special arrangements of illumination and visible marking distance from the runways, etc.

Hungary:

The presence of trees and bushes is controlled by obstacle restriction consideration.

The Netherlands:

There is no regulation regarding the existence of trees and bushes in the vicinity of the airport.

Poland:

No general regulations.

South Africa:

No, except the normal regulations in connection with obstruction clearances (Flight Path).

Sweden:

There are no regulations regarding the existence of trees and bushes in the vicinity of airports or runways at airports, but we are very careful about this problem in airports situated in bird rich areas. Especially, when the Malmö-Sturup Airport was built, we eliminated a considerable amount of trees and bushes for the reason of diminishing the attractiveness for birds.

Switzerland:

Regulations are only available with respect to obstacles (ICAO Annex 14).

United Kingdom:

Trees and bushes are treated as obstacles within areas to which the consultative procedures in the "Town and Country Planning (Aerodromes) Direction, 1972" apply. Where the "Local Planning Authority" and CAA cannot agree on the presence of trees and bushes, an inquiry could result leading to a ministerial decision.

USA:

The only Federal regulations that might be applicable to trees in the vicinity of airports involve those regulations defining obstructions to navigable airspace. From a bird hazard standpoint, the FAA has published guidance recommending that no trees or shrubs be planted closer than 600 feet (180 m) from the centre line of active runways and taxiways. The Canadian document AC 70-11, Airport Grounds Development and Maintenance Manual, provides excellent information and guidance on this subject.

3. Three courses of aciton should be considered by the Aerodrome Working Group.

a) Due to the differences in the local conditions at each airport in each country, no recommendation should be made, and the problem be left in abeyance after the above material has been made available to the competent authorities.

b) A recommendation from the meeting should be worked out.

c) Based on the discussion on the Working Paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the Working Group for approval.

BSCE/13 AERODROME WORKING GROUP WP

Use of Chemicals to make the Soil of Airport Surroundings unattractive

(presented by the Vice Chairman of the Aerodrome Working Group)

1. INTRODUCTION

In accordance with the recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

Do you use any checmicals to make the soil of the airport surroundings unattractive to birds?

If yes, give any details.

2. Answers have till April 14, 1978 been received from the following countries: Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden, Switzerland, United Kingdom, and USA
and are as follows:

Austria:

Not on the airport surroundings.

Belgium:

No.

Canada:

The only chemical being used to make airports less attractive to birds is: "Benomyl". This chemical is used to eliminate earth worms in grass areas beside runways. This reduces the food available to birds.

Czechoslovakia:

At the airports in Czechoslovakia we do not use any chemicals to make the soil of the airport surroundings unattractive to birds.

Denmark:

Copenhagen Airports Authority has carried out an attempt with the chemical "RETA", which is synergized aluminum ammonium sulphate, and bought at ASSIA Maabarot, Israel, as a bird repellent. The attempt was made in the spring 1977. To most of the birds the effect was very small, but to some of the birds, for example the oyster catcher, there was no effect at all. The chemical was tested in an area where the grass was cut very short. In the observation period there was a normal fall of rain. Probably,the grass grew over the laid out chemical rather quickly and after a short time it was washed out by the rain water. On account of the environment protection new experiment with chemicals are not done or planned, as the authority is afraid of environmental damages with the use of chemicals in nature.

The Federal Republic of Germany:

Use of chemicals is abandoned in the interests of the environment.

France:

A weed-killer (U 46, a mixture of 2.4 DP, MCPP + MCPA) has been used for three years spraying it over the sward of the Orly Airport. These sprayings have made it possible to get rid of the clover which nourished wood pigeons. Seed-grain treated with Chlorophacinone is likewise used at the Lyon-Satolas Airport to kill voles which are attractive to a great number of birds of prey. Finally, experiments are now being made with the bird repellent remedy RETA at the airport of Marseille-Marignane.

Hungary:

No chemicals are used at present.

Israel:

In practice only on a strip adjacent to the runway are chemical means employed for the destruction of weeds. We are now in the process of preparing the expansion of use of these chemicals in wider areas.

The Netherlands:

Chemicals to make the airport surroundings unattactive to birds are not used. So far no chemical method has proved to be successful.

Poland:

No experiences.

South Africa:

At one airport an insecticide was used to kill insects on which the birds feed, but the results were disappointing.

Sweden:

No. We do not use any chemicals to make the soil of the airport surroundings unattractive to birds.

Switzerland:

No use of chemicals until now.

United Kingdom:

Birds are not attracted by soil per se, only by the seed or insect life it supports. Chemical methods to reduce the food supply are used as local needs dictate given identification of local requirement:

a) As a fertilizer to improve growth of "long" grass which deters some bird species. An annual dressing after the first cut of the season has been 25 to 37.5 kg/ha each of P and K, with addition of N where necessary.

b) As selective weedkillers used to reduce number of broad-leaved plants to reduce seed and foliage available for herbivorous birds. These are based on a UK booklet "Approved products for farmers and growers" which is revised annually.

c) As Lumbricide and insecticide applications to control earthworms and insects but in recent years the only use has been of DDT to control tipulids (cranefly larvae, etc.) by BAA at Heathrow over the past 2 years. They use DDT concentration approx. 1.5 litres of 25 % emulsifier to 100-130 litres water. Results have been incouraging in that the relevant bird population has been reduced significantly during the "cranefly" season. Other airports are considering the technique but have been advised

a) to ensure the insect correctly identified to the bird problem, and

b) that approval is obtained before use from local agricultural and Water Authorities.

d) To date in UK, chemical methods of repelling birds directly have not been successful. An attempt recently to repel Lap Wings by an application on grass of synergised aluminium ammonia sulphate (RETA, CURB) proved unsuccessful. The results will shortly be published.

USA:

Chemicals are not, to our knowledge, used on airport soils to make the airport unattractive to birds. Chemicals such as Avitrol have been used on garbage dumps and sanitary landfills for this purpose with mixed results.

3. Three courses of action should be considered by the Aerodrome Working Group.

a) Due to the differences in the local conditions at each airport in each country, no recommendation should be made, and the problem be left in abeyance after the above material has been made available to the competent authorities.

b) A recommendation from the meeting should be worked out.

c) Based on the discussion on the Working Paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the Working Group for approval.

BSCE/13 AERODROME WORKING GROUP WP

Bird Dispersal Devices

(presented by the Vice Chairman of the Aerodrome Working Group)

1. INTRODUCTION

In accordance with the recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

If you use or have used bird dispersal device, it being visual scaring, bird corpses, bird models, acoustical scaring, it being ultrasonic sounds, non-natural sounds, natural sounds, and synthetic sounds, and/or combined visual and acoustical scaring; it being pyrotechnics, birds of pray, remote-controlled model aircraft, you are requested to provide details both on devices being successful, and devices judged to be unsuccessful.

2. Answers have till April 14, 1978 been received from the following countries: Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden, Switzerland, United Kingdom, and USA
and are as follows:

Austria:

Successful bird dispersal devices are:

Vehicle patrols and fire fighting cars fitted with loudspeakers and sirens;

shell crackers; gun-shooting hunters; crow corpses.
Unsuccessful has been: tracer ammunition when scattering crows.

Belgium:

Civil airports: Shell crackers are successfully used. Also live ammunition is sometimes used.
Military airports: Shell crackers, dummies, eagle test gas and carbid cannons. These methods seem to be successful when shifting from one method to another.

Canada:

Many devices and techniques have been used to disperse birds at airports in Canada. Methods which are successful,if used properly, are shell crackers, flashing lights. taped bird distress cries, leaving dead birds near runways, stringing wires across open bodies of water, falconry, live shotgun fire, and flares. The use of remote-controlled model aircraft was found to be ineffective.
The above methods of bird dispersal are used at various airports in Canada, but are first assessed on a cost/benefit basis. If the amount of bird scaring required is to be reduced, it is necessary to modify the airport so as to make it less attractive to birds than the surrounding area.

Czechoslovakia:

On test base there are stable bio-acoustical scaring apparatus that reproduce sounds of birds being in danger; they reproduce sounds of those species that mainly occur in the airport area. Such a device has been installed at the airport Prague-Ruzyne. In the meantime we cannot state any unambiguous conclusions about the efficiency of that device.

Denmark:

Copenhagen Airports Authority has a means to scare the birds away by putting their distress calls in the air by a tape recorder mounted on a vehicle. In this way it was found that seagulls might be scared away, whereas starlings and lap wings not so easily will fly away. The effect of transmitting of distress calls will be improved, when pyrotechnics or live ammunition are fired at the same operation. Further, it is of essential importance that the distress calls are transmitted without technical noise from the recorder. That means that the equipment must be of high technical quality.

At military airports the bird patrols use combined visual and acoustical scaring. At provincial civil airports only visual scaring is used.

The following equipment is in use:

a) Bio-acoustic bird scaring equipment:

Philips N 2605 Cassette Player
Power requirements 12 V DC
Philips WT 037211 amplifier
Philips L.B.C., 3360/00 loudspeaker

We are using natural sounds (distress calls) from the following species: Herring Gull, Black-headed Gull, Common Gull, Lap Wing, Starling, Rook, and Jackdaw. Original recordings were supplied by Mr. T. Brough, U.K. We have now used bio-acoustic bird scaring equipment at two military airports since 1st July, 1977. The effect is good for all species, except Starling and Lap Wings. The acoustical scaring is used in combination with visual scaring with shotguns and pyrotechniques.

b) Pyrotechnique scaring equipment is used at all military and provincial civil airports. The following equipment is used:

Pistols:

1. Weinberg pistol 6 mm F.B. Record (one shot)
2. Röhm RG 76 6 mm (six shots)

Ammunition:

Blank cartridges 6 mm
Moog-Vogelschreck, cal. 15 mm

Röhm RG 76 is the most efficient and can be recommended.
Pyrotechnique scaring equipment is mainly used (and most effective) in combination with acoustical scaring and visual scaring with shotguns.

c) Visual scaring (presence of bird-car) with shotguns is used at all military and provincial civil airports.

Shotguns:

Browning cal. 12 (Air Force)
AYA Shooting Star
Other models

Ammunition:

Shot-cartridges, pellet size 5 and 7 (Danish numbers)

Birds are regularly killed to avoid habituation to other bird dispersal devices and it has proved to stimulate the effect (Protected birds are not killed). Habituation to visual scaring with shotguns is much less than to other bird dispersal devices.

The Federal Republic of Germany:

The application of ad hoc methods for the prevention of collisions between birds and aircraft in the Federal Republic of Germany is regulated according to the recommendations of the biotop expertise following the guidelines of the Ministry. In the Federal Republic of Germany the following ad hoc actions are primarily taken to scare away birds at civil airports.

Pyrotechnics

Scaring away with shotgun

Acethylen gas cannons

Electro acoustical devices (mounted on vehicles)

Disposal of bird models has so far proved to be of little use. The same experience goes for the use of ultrasonic sounds (however, still with no conclusion of the experiments).

Falconry seems impracticable to us at civil airports.

France:

The following remedies used in France to frighten away birds, are at present considered the most efficient:

- acoustical scaring away through distress call devices mounted on vehicles (mobile installation)

- pyrotechnics: cartridges with double detonation, pistols, and shotguns.

Other techniques with which experiments have been carried out in France, such as visual aids, falcons alive or as dummies, and audio-visual alarm systems, have sometimes proved to be efficient, but too expensive, and very difficult to use (far too sophisticated equipment and equipment which requires full-time employed personnel).

The following details are an extract from a paper presented at BSCE/12 by J.L. Briot:

EQUIPMENT AND METHODS FOR DISPERSING BIRDS USED ON FRENCH AIRFIELDS

Among the various methods planned for dispersing birds on airfields, only few systems are really efficient and can effectively be used on an operational basis. The objective of this paper is to accurately describe the scaring equipment presently used on French airfields, and to explain two methods of bird removal giving full satisfaction.

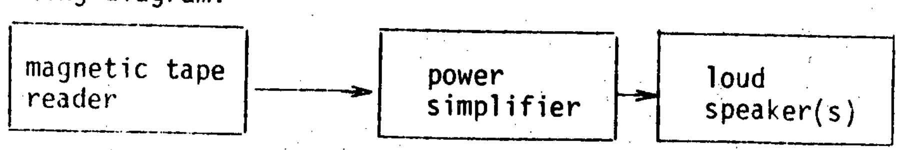
I. SCARING BIRD EQUIPMENT

Two types of equipment, well-known for a long time and having given proof of efficiency, have been developed in France, i.e.:

- acoustical bird scaring equipment
- pyrotechnic devices

I.1 ACOUSTICAL BIRD SCARING SYSTEMS

Based on the principles of broadcasting distress calls already recorded in a laboratory, all those devices are designed in accordance with the following diagram:



Three versions meeting various needs have been realised in France: they are the mobile version, the semifixed and the fixed ones.

I.1.1 MOBILE ACOUSTICAL SCARING SYSTEM

This system includes

- 1 reader amplifier (type EGA 2 - Schlumberger) this device was designed to allow the running of two magnetic tapes in looped circuit, at a constant speed, with a maximum fidelity in the high frequency reproduction. The all transistor power amplifier has a 40 watt R.M.S. output at an extremely low distortion ratio.
- 1 or 2 compression drivers loudspeakers.

. either of the lansing JBL type or Altee; those HiFi loudspeakers in high frequencies, are characterized by drivers providing a very high acoustical efficiency and exponential or multicell horns.

. or of the University sound type, CLH or geloso model; these loudspeakers have more standard horns.

- 1 ATEI 24/220 volts converter supplied with 2 100 AH FULMEN Batteries.

The whole equipment is located in a light vehicle Renault 4L light van type The equipment is manually driven by an operator on request of the tower controller.

ADVANTAGES: Thanks to the equipment compactness, low space required, thus, easy installation on any kind of vehicle.

- low cost (20,000 F about)
- high efficiency because the operator can come very close to birds and back up the efficiency by firing a shell cracker.
- 2 prerecorded distress calls.

DRAWBACKS:
- low acoustical output, low range
- full time personnel required
- fairly long intervention

Those mobile scaring units are now in operation on the aerodromes of Ajaccio, Beauvais, Bordeaux, Brest, Lyon-Satolas, Marseille, Orly, Roissy, Salon de Provence, St. Nazaire, St. Denis Gillot, St. Yan,and Toulouse.

I.1.2 SEMI-FIXED ACOUSTICAL SCARING SYSTEM

In fact it is the same unit than the one described above, but the actuation is made remotely from the control tower. The operation principle consists in keeping the vehicle in a "stand by" position in a selected location (2 week duration about) and starting the equipment when necessary.

This vehicle includes:

- 1 mini-cassette reader, auto-reverse type likely to indefinitely read 1 distress call.
  (UHER stereo CR 210 model)
- 1 100 watts R.M.S. power amplifier (Altec 1594 B model)
- 1 loudspeaker with 4 compression drivers (University Sound 4A4L model)
- 2 12 volts 100 AH batteries; 1 battery charging set and one 220/24 v stabilized power supply.
- 1 Telecar TS receiver (Telefunken) and one decoding device for double tone LF signal.

- 1 photoelectric cell allowing automatic interruption of the receiver stand by position to limit electric consumption.

The whole equipment operates at the 24 volts low voltage and its input current is very low; the operational duration of this system is of 2 weeks at the rate of 5 minutes a day of full power operation.

The Telecar TS transmitter and the decoding unit are located in the control tower, as well as a variable time delay device (0 to 5 minutes) allowing automatical stop of the transmission of distress calls in case of controller's omission.

ADVANTAGES:
- various ways of utilization: mobile or fixed station, on mains or battery
- avoids full time personnel utilization
- high acoustical power, long range
- low consumption: large operational duration
- very light volume and weight of equipment
- low cost (60,000 F about) every part being available on the market.
- very easy maintenance.

DRAWBACKS: none! (the use of one single cassette reader is preferable in order to avoid confusion between bird species by the tower controller).

The new model of acoustical scaring vehicle, installed at Nice and recently at Marseille seems full of promise because it holds advantages of mobile and fixed equipment.

I.1.3 FIXED ACOUSTICAL SCARING SYSTEM

The Nice Côte d'Azur airport where bird hazards were important, was the only one to be equipped in 1975.

The installation includes 2 separate scaring stations, one located at the Glide level, protects aircraft during landings, the other located at the middle of the runway, protects aircraft during take-off.

Each station includes:

- 1 metallic cabinet with thermostat including:
  - . 1 type EGA 2 amplifier-reader (cf. Section I.1.1)
  - . 1 80 watt R.M.S. additional power amplifier (type TAM 657 Schlumberger)
  - . 1 cabinet including the decoding device for the remote-controlled signals.
- 2 35 watt, loudspeakers (geloso) fed through the EGA 2 amplifier, and located 200 and 300 metres from the reading device.
- 2 60 watt JBL lansing loudspeakers fed through the TAM 657 final amplifier located near the reading device.
- 1 decoding unit for remote-controlled signals.

Stations are remote-controlled through lines from the control tower according to the following orders:

(tape cartridge No. 1 "on" (with automatic stop after 5 minutes operation)
(tape cartridge No. 2 "on" (with automatic stop after 5 minutes operation)
("off"

One pilot lamp shows the tower controller:

. the station in operation

. the scaring call transmitted

The loudspeakers are replaceable, set at 100 metres apart and sited toward prevailing winds.

ADVANTAGES:
- no full-time personnel
- possible switching on of the selected station according to bird location on the airfield
- selection, from the tower, of the suitable distress call, according to bird species on the airfield. (2 cartridges by reader).

DRAWBACKS:
- very costly installation
- heavy and difficult maintenance
- birds can become accustomed in case of too many utilizations of the system.

This method of scaring has given, for the time being, more disappointment than good results (great problem of maintenance and control of the equipment very exposed to bad weather.

For the future, it would be better to install the tape reader in the technical building for example,and transmit acoustical signals through land lines up to remote amplifiers located near the loudspeakers.

I.2 PYROTECHNIC DEVICES

After tests on the various shooting systems and cartridge models, we have selected the following equipment which gives all satisfaction:

- Shell crackers (designed to project a small exploding bomb which explodes at the end of trajcctory), mark: Penguin Industries Inc., USA, plastic case, calibre 12, lenght 55 mm, range 120 m for a 30^{0} angle, very low failure rate, low price (about $1 each).
- Pistol VEREY pistol type, calibre 40 mm, with a reduction tube allowing firing calibre 12 cartridges (Manufacturer: Société LACROIX, France).
- Gun One-shot guns, calibre 12, smooth-bore gun non choke-bored, allowing firing shell-crackers with an increased accuracy and range. We use either the gun SIMPLEX made by MANOFRANCE, or the one-shot Winchester, calibre 12 MAG.

Those devices used in conjunction with acoustical scaring vehicles give often good results. Utilized alone, they allow quick clearance of the runway, but the scaring is temporary.

Acethylen and Propane Gas Cannons

Tested at Nice Côte d'Azur to disperse gulls and at Paris Orly against wood pigeons, those two types of gas cannons gave bad results: Birds became accustomed to these regular explosions which let them indifferent.

Better results have been obtained:

- by moving cannon every 2 or 3 days,
- by changing frequency and power of detonations,
- by installing conjointly human silhouettes holding guns (scarecrows)

II DISPERSING BIRD METHODS

II.1 REMOVING OF WOOD PIGEONS

This method, the theoretical principle of which was presented at the 11th meeting of the BSCE, can be applied to all airfields where wood pigeons come to feed themselves with clover of grass lands. It consists in spreading at spring on these grass lands a solution of Super U 46 (1) (a mixture of several phytohormones destroying dicotyledones), at a ratio of 4 l/ha of product and 600 l/ha of water. Spreadings may be repeated each year up to full removal of clover. This method has been utilized successfully on Orly Airport in 1976 and 1977.

II.2 REMOVING OF RAPTORS

The method consists in destroying voles and other small mammals which are important part of the alimentary diet of raptors. To this aim we use seed grains treated with 0.0075 % w/v chlorophacinone, a patented synthetic anticoagulant destroying specificly these small rodents.

These sprayings can be made:

- either mechanically by means of agricultural seeders (dispose baits in 5 m apart parallel lines at a rate of 15 to 20 kg/ha).
- either manually by disposing plastified sachets (2) containing 25 g of grains in infested locations.

As these sachets are waterproof, it allows a better preservation of grains while avoiding their consumption by birds.

The treatment must be realised before field vole pullulation March April, i.e. the period during which the population density is low.

This fighting method against rodents has been utilized this year on the Lyon-Satolas Airport and contributed to fairly diminishing the number of raptors observed on the field.

CONCLUSION

Among the three types of acoustical equipment regularly utilized in France, only the semi-fixed version seems fully suitable for airport requirements while offering a maximum efficiency.

The American "Penguin" cartridges, fired with calibre 12 guns are the pyrotechnical means which gave best results (reliability, security, low failure rate).

200

The removing methods of wood pigeons and raptors, based on removal of food sources, are easy to follow and full of promise regarding the foreseen results. An experimentation based on several years will give the opportunity to define this method's efficiency by removing hazards due to meteorological conditions.

(1) mixture of 2.4 - DP, MCPP and 2.4 - MCPA

(2) these sachets are manufactured by "LIPHA", (Lyonnaise industrielle pharamceutique in France).

Hungary:

Acoustical scaring is to be introduced shortly.,Presently, no experience available.

Israel:

Up to the beginning of this year several bird dispersal devices were in use, both visual and acoustical by the usual means: gas cannon, noisy rifle shots, broadcasting of distress calls, and also the suspension of "scare models".

Only now, in 1978, did we start systematic and regular actions, and we shall be able in future to evaluate the results of everyone of the means employed - including chemical bird repellent RETA which we shall try in combination with other means

It is regretted that up to now we have not arrived at any clear conclusions.

The Netherlands:

Devices used at Schiphol are:

Device used:	Effectiveness:
Pyrotechnics	very good) in combination
Tapes with bird cries	good) in combination
Corpses	good, as long as they are fresh
Bird models	medium, have to be shifted
Day-glow wind mills	- ,- - - -
Search lights	in darkness - medium
Gas cannons	good

A rather unsuccessful demonstration with a bird of pray was held. A new demonstration is on the 1978-programme.

Poland:

Pyrotechnics and hunting with moderate results have been used.

201

South Africa:

No sophisticated devices used. Shotguns are used. Vehicles are used to reach points on airfields where birds congregate.

Sweden:

Swedish Civilian Airports are equipped with:

A. Signal pistols

used for firing bird crackers. The effect is good, especially, at flock-living birds (gulls and waders). Handled by the field staff or the fire brigade.(been used together with "distress call", where this is available).

B: Rifles and shotguns

most airports have shotguns (for birds and small game shooting) and rifles (for big game) available. Special permissions are given by the authorities, permitting shooting (of selected species) outside the open hunting season, and to use cars when hunting.The aim of the shooting is not to reduce the number of birds, but as a scaring device.

and some airports are equipped with:

C: distress calls

distress calls have been used mainly at Gothenburg/Torslanda Airport (in connection with signal pistol and shooting).
Good success has been reported.

Finally, in the near future we hope to be able to start experiments with a machine gun dummy (originally constructed for military training purposes). The dummy can be remotely controlled from the Tower,and up to 20 (or more) dummies, that are highly mobile, can be in use simultaneously.

Switzerland:

Military airfields:

- Pyrotechnical means (best results, when the explosion is combined with development of smoke: (Rauch-Knallpetarden).
- Models of dead gulls (experiments just begun with colour prints on gull silhouetts)
- Distress calls (no reliable results because usually used in combination with pyrotechnics; in the few cases where distress calls have been used alone, the result was good: gulls staying away for several hours or even for the whole day)
- From time to time single birds are shot in order to increase the effect of the dispersal methods
- 2 months experiments with ultrasonic noise gave no positive result.

Zürich Airport:

- Carbid cannon (only short-term effect, quick habituation)
- Shell crackers (only limited effect)
- Flares (good effect when carefully applied)
- Shooting at single birds (gulls), only effective when used in combination with other methods
- Deposition of dead gulls (effective only during a few day; afterwards the carcasses look too badly or are taken away by other animals
- Deposition of gull models (experiments just begun with colour prints on gull silhouetts), first trials seem positive but time-consuming
- Distress calls (if not used very carefully, no convincing results can be obtained).

United Kingdom:

a) The following dispersal devices are in regular use at all British Airport Authority controlled airfields:

(1) Distress Call Broadcast Equipment (SAPPHO)

DETAILS OF SAPPHO EQUIPMENT

1. The technical specification is that recommended by the Pest Infestation Control Laboratory, Ministry of Agriculture and Fisheries.

Cassette Player:	Output Impedance	- 20K OHM
	Power Supply	- 12V
Amplifier :	Power Supply	- 10-16V DC
	Output Power	- 10W - max 15W
	Distortion Rate	- 3 % at 10 W
	Output Impedance	- Variable 4-8 OHM
	Frequency Range	- 200 to 10000 HZ
	Deviation	- 3 dB
Speaker :	Power	- 30W
	Impedance	- 80 OHM

2. These units are locally packaged using tapes supplied by PICL.

(2) Shell Crackers

Large quantities of shell crackers are used together with smaller quantities of hammers. We also use some saluting blanks in congested area near buildings and aircraft, or where fire crackers might cause a fire hazard (e.g. dry grass area). We also experimented with 12-Bore Shotgun percussion caps but these are less effective.

(3) Visual Scares

Operators adopt visual methods (e.g. beating arms, etc.) when appropriate. The above methods when used by a trained operator are judged effective. BAA also investigate other techniques with the Pest Infestation Control Laboratory (PICL) and hope shortly to try sculptured gull models (from USA) and a Swedish acoustical system which broadcasts aircraft noise through fixed amplifiers

b) Some 10 % of UK military airfields use Falconry methods, but it is always used in conjunction with one or more of the alternative techniques. As a technique falconry is successful, but is, nevertheless, unacceptable on the majority airfields, e.g. no UK civil airfields use Falcons to date.

Below is a review of unsuccessful techniques:

REVIEW OF UNSUCCESSFUL TECHNIQUES

1. Regarding unsuccessful devices, it is tempting to ignore them as of no consequences but realising that other researchers may wish to confer on such matters, brief summaries of some of the more topical investigations on which Pest Infestation Control Laboratory has some information, are presented. It must be understood that under different circumstances some of these methods may prove more successful but their promise has not warranted further action. None of this work has been published.

2. Bird "Models". Up to 20 skins of herring gulls (Larus argentatus) and lesser black-headed gulls (L fuscue) mounted in realistic attitudes (standing and resting) had neither attracting nor repellent effects when placed on an airfield frequented largely by common gulls (L canus). A life size wooden model of a gull equipped with a wind vane and an extended wing which (sometimes) flapped idly in the wind was also unimpressive.

3. Life-size silhouettes of black-headed gulls (L ridibundus), common gulls (L canus) and herring gulls (L argentatus) with wings outstretched and cut out of 1'' polystyrene sheet and then painted, had limited scaring effect on gulls when scattered on o loafing site by a refuse tip. Some models were damaged by pecking including those placed in a small breeding colony of common gulls on an airfield. Although results to date are disappointing,work continues on low priority.

4. Ultrasonic noises in the range of 18-30 KHz generated by an electric pump operating on galton whistle produced no avoidance reaction in aviary tests with starlings (Sturnus vulgaris), jackdaws (Corvus monedula), magpies (Pica pica), jay (Garrulus glandarius) and feral rock doves (Columba livia var) and very little response from house sparrows (Passer domesticus).

5. Synthetic sounds. In 1968 field tests, using broadcasts of minimum duration of 10 seconds, were carried out with an electronic device produced by the Av-Alarm Corporation, 1901 Old Middlefield Way, 15 Mountain View, California, USA, against house sparrows, starlings, feral rock doves, lapwings (Vanellus Vanellus), oystercatchers (Haematopus ostralegus), golden plovers (Pluvialis apricaria), common gulls and carrion crows (Corvus corone). The results were regarded as being very poor. In the winter of 1970/71 a further device of this nature was tried operationally on an airfield largely against gulls, lapwings, corvids and starlings. Effective clearances were obtained in 45 % of dispersal attempts which compared poorly with the 85 % normally achieved with distress call broadcasts. It should be mentioned that Av-Alarm equipment is capable of producing a very wide range of frequencies with almost infinite variations and this, in the absence of explicit recommendations on how best to operate against particular species, makes testing a time-consuming business.

USA:

A variety of bird dispersal devices have been are being used on U.S. airports again with mixed results. The most successful techniques have been acoustical scaring (both synthetic noise and bird distress calls), visual scaring, pyrotechniques (shellcrackers and live ammunition), and gas cannons. Bird corpses, bird models, ultrasonic sounds, birds of prey, and remote-control model aircraft have been judged as unsuccessful.

3. Three courses of action should be considered by the Aerodrome Working Group:

a) Due to the diffences in the local conditions at each airport in each country, no recommendation should be made, and the problem be left in abeyance after the above material has been made available to the competent authorities.

b) A recommendation from the meeting should be worked out.

c) Based on the discussion on the Working Paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the Working Group for approval.

AD F616127

BSCE/13 AERODROME WORKING GROUP WP

Organization of the Scaring away of the Birds. Use of Fixed Installation or Mobile Units.

(presented by the Vice Chairman of the Aerodrome Working Group)

1. INTRODUCTION

In accordance with the recommendation of the 12th BSCE Meeting in Paris in October 1977 the Vice Chairman asked by letter of January 3, 1978, participants to the Aerodrome Working Group Meeting from 18 countries to give information on the following subject:

How is the scaring away of the birds organized ? Do you use fixed installations or mobile units, and do you scare away both before take-off and landing?

2. Answers have till April 14, 1978 been received from the following countries: Austria, Belgium, Canada, Czechoslovakia, Denmark, the Federal Republic of Germany, France, Hungary, Israel, the Netherlands, Poland, South Africa, Sweden, Switzerland, United Kingdom, and USA
and are as follows:

Austria:

Representatives nominated by the Aerodrome Operator are responsible for the scaring of birds before take-off and landing of aircraft. At each Austrian airport there is individual proceedings in use - preferably mobile devices.

Belgium:

Civil Airports: Shotgun patrol operates to repel birds. In the near future this patrol will be equipped with distress calls.

Military Airports: Next to the methods already used it is planned that at each airport a "birdman" will operate. He will use distress calls with the method already used to repel birds.

Canada:

Bird scaring activities are the responsibility of the airport manager and his staff. Most activities are carried out from a mobile unit. The frequency of the activity is related to the number of birds on the airport. When bird numbers are heavy, scaring generally takes place before each take-off and landing.

Czechoslovakia:

The scaring away of the birds is performed mainly by means of mobile equipment using alarm horns, lights and flashing lights on a vehicle.

Denmark:

Copenhagen Airport:

Scaring of birds from the airport area is carried out by specially picked persons from the airport police staff. They are equipped with a motor vehicle "VW Golf", shotguns, pyrotechnics, distress call tape recorder, and VHF radio with tower frequencies. The staff can either on their own initiative or on request from the tower or pilots scare the birds away. The bird scaring staff is on duty all the 24 hours of the day. Normally, only one person and one vehicle is on duty, but if large flocks of birds appear, extra staff might be called. This special staff has taken a course in hunting, as Danish law demands a licence for scaring birds away with live ammunition. In total about 20 persons of the staff have the required training. The persons who are not on bird scaring duty, participate in the normal airport police work.

The military airports and the provincial civil airports use mobile units, and scaring is carried out both before take-off and landing.

The Federal Republic of Germany:

Devices for scaring away birds are mounted on vehicles (mobile installation). These measures are taken to scare away birds both at landing and take-off of aircraft.

France:

Airport at which the rate of bird hazards is frequent, and consequently, a serious threat against aviation safety (16 in all) have been equipped with acoustical scaring away devices installed either on vehicles or mounted on fixed installations. The Airport of Nice - at the Mediterranean - is the only airport that use, and with success, a fixed installed acoustical scaring away device, however, causing much trouble with the maintenance.

Hungary:

The organization of regular bird scaring is presently under way, the final set-up yet to be determined.

Israel:

Although we have up to now not arrived at any clear conclusion we employ one single man, who activates static means in the field. In the near future we propose to convert this into a mobile unit, but it is evident that we shall have to continue with static devices like the gas cannon as well.

The Netherlands:

There is a round-the-clock bird patrol with a special car, equipped with a tape recorder and pyrotechnics. The bird patrol is carried out frequently during the day and night. Special attention is given to the runways in use. Prior to allowing traffic on a runway which has not yet been used for some time an extra bird check is carried out.

Poland:

Pyrotechnics and hunting with moderate results have been used.

South Africa:

Shotguns are used. Vehicles are used to reach points on airfields where birds congregate.

Sweden:

No answer.

Switzerland:

No fixed installations are used. Flight safety personnel is responsible for the application. Cars are used to get the appropriate location. At Zürich Airport application is made on request of the tower or of the pilots; at the military airports application is made according to the own decision of the personnel responsible for scaring.

United Kingdom:

A senior member of the aerodrome management/operations staff should be responsible for the Bird Control organization, co-ordinating operator training, supervision and maintaining records of operational and incident data. The CAA inspect the bird-control organization as part of their licensing inspection, giving advice and making recommendations as necessary. The Pest Infestation Control Laboratory is employed as specialist advisors in this context. On airfields operated by BAA, bird-control is exercised by Apron Control Staff. Depending on airport size they are equipped with up to three vehicles with SAPPHO, etc., and operate throughout airport opening hours. Most of these staff will have attended the Pest Infestation Control Laboratory training course. Bird scaring is carried out whenever necessary, including both before take-off and before landing.

USA:

Mobile units are used with greater effect in the U.S. than fixed installations. It is our belief that fixed installations lose some of their effectiveness over a period of time.

3. Three courses of action should be considered by the Aerodrome Working Group.

a) Due to the differences in the local conditions at each airport in each country, no recommendation should be made, and the problem be left in abeyance after the above material has been made available to the competent authorities.

b) A recommendation from the meeting should be worked out.

c) Based on the discussion on the Working Paper the Chairman should be asked to draft a recommendation to be presented at the next meeting of the Working Group for approval.

ADF616128

First experiences with seagull models at Zurich Airport

The airport of Zurich is situated in a plain between Kloten, Rümlang and Bülach. To the south, in a distance of about 11 km, there is the lower part of the lake of Zurich. To the northwest, in a distance of about 7 km, there is the reed of Neerach. These two areas which are offering ideal living conditions for different kind of birds are about 16 km apart - the direct line between the two sites is touching the airport area.

Today's airport territory was previously a swamp area and was used as an artillery shooting exercise field. Large areas of the land were ameliorated for the construction of the airport. Some areas falling under the national trust property were left in their natural condition.

Zurich Airport covers an area of 724 ha. In this zone the following kind of birds which are rare and therefore protected in Switzerland find ideal living conditions:

pheasants
snipes
quails
herons
owls
buzzards
kites
falcons.

According to our experience these birds have not presented a potential hazard to air traffic so far. However, during many years we have been experiencing bird strike problems with seagulls, peewits, starlings and pigeons. Seriousness and frequency of the bird strikes are in the order mentioned. Therefore, our main efforts were concentrated on the problems concerning seagulls.

The assembling of seagulls at Zurich Airport results out of the habit of these birds to fly to and from their sleeping area, the lake of Zurich, and the swamp area of Neerach, where they find ideal feeding conditions. On these daily flights and especially from the end of autumn until the beginning of spring they stop over at the airport area for feeding and, we assume, to rest on the warm ground. This assumption is based on many years of observation during which we could notice that the seagulls are using runways and taxistrips as resting areas. This habit inevitably leads to collision danger with aircraft landing and taking off.

As a first counter-measure carbide guns and pistols were fired to frighten the birds. The result was that the birds got uses to the shooting after a short time and even sat on the guns in operation. After this, various other means were applied:

- cries of distress of seagulls from tape recorder over loudspeaker
- high-frequency sounds, raised in intensity which were believed to be unbearable for the bird's ears.

The results werde disappointing - after a comparatively short time the seagulls also got used to these measures.

Shooting of the birds and removal of the carcasses showed no better results. After flying a wide circle the seagulls settled again on the same area.

Following this we were carrying out small experiments by shooting the birds and leaving the carcasses on the ground. The results were good. The birds avoided the areas where the carcasses were lying. Unfortunately the carcasses were soon removed by birds of prey and foxes. This experience let to the idea to produce and to use wooden models of seagulls. Immediately after shooting seagulls we took pictures served our people in the workshop to manufacture the models. Seen from the air the human eye cannot differenciate between a dead seagull and a dummy.

Flocks of seagulls in critical zones are being fired at by the gamekeeper. Afterwards, about 20 dummies are distributed over 1 to 3 ha. After this action the birds which were first frightened by the shooting move away to another site.
After 3 to 4 days the dummies are picked up again. This procedure is being repeated whenever necessary.

Since 3 years this system is being systematically applied at Zurich Airport and has proven to be quite successful. The cost of material is very low. The disadvantages of the system are

- it is rather time consuming
- it requires quite some manpower
- it cannot be applied on active runways and taxiways. However, when applied on the shoulders of the strips the system shows sufficient effect for the operational area of the airport.

29.5.78 EF/cl

211

AOFWG29

BSCE 13 / WP 14/78

About effects of agricultural and grassland use on airfields - reducing bird populations

Report given bei Dr.J.Hild,GAF, 558 Traben-Trarbach,Mont Royal

Bird populations in all regions of Europe depend - in quality (species) and quantity (frequency) as well as in appearance on various parameters of ecological manner and of human use. The number of birdstrikes correlates with these parameters. Under unfavourable ecological conditions, f.i. poor soils without any small animals and without intensive grassland use, the bird population will be low, the birdstrike risk, too. Under favourable ecological conditions, f.i. soils which are rich in small animals(food for birds) and permanent used by mowing grass, the bird population and birdstrike risk will be high. Under these conditions reduction of birds can only reached by changing the ecological background, by changing the type of use and/or by scaring birds with pyroacoustic and electroacoustic installations, but these last mentionned methods proved to be not so effective. Therefore the ecological way will be the best always.

It is well known that agricultural use on airfields is attractive for birds (small birds like sparrows,finches, but also pheasants,partridges,crows,pigeons and gulls) especially during harvest- and sowing-periods; it is well known that sheep grazing or something like that favours bird appearance and moreover we know - many years observations in U.K. and Germany showed it - that long grass is not so favourable for birds as permanent short grass.

Since more than 10 years in German Air Force Airfields corresponding investigations and observations were made. Some investigations are going on at the moment, the planning is over 4 further years in various regions under different ecological conditions. But some results as to the effectivity on birdstrike number can be demonstrated.

1. Sheep-Grazing

It was done on more than 10 German Airfields until 1970. The consequence : airfields with sheep had a relative birdstrike

number of 15.0, airfields without sheep grazing only between 5.0 and 8.5. After prohibition of sheep grazing (1970) the number of birdstrikes decreased conspicuous, but another problem was coming up : the type of cutting grass hitherto done by sheep had to be changed. Therefore the most airfields decided to cut grass by permanent mowing. The consequence : development of large organic layers on the soil which were very favourable for small animals like larvae and myriopodes, a good food for birds and a good substrate for breeding. Moreover, by sheep grazing the soils were condensed so that precipitation was not able to run away. The consequence : large areas were falling moist and wet, other species of birds appeared, the permanent mowing became more difficult. So other possibly combined methods of handling/using grassland had to be found.

2. Grassland - Handling

At grassland-handling it must be differed between the extensive and the intensive method. Simplified we can say that the first method consists in a mowing from time to time (2-3 x per year) with clearing the grass and the second method in a permanent mowing with or without clearing the grass. Another type of extensive grassland-handling is the use of growth prohibiting substances.

More years observation and statistics show a verry narrow dependency and relation between birdstrike risk, birdstrike number and methods of airfield use.

3. Statistics

Since 1967 (Fig.1) German Air Force had a decreasing number of birdstrikes at take off and landing within the direct airfield areas. That positive result could be reached by using combined methodes of bird scaring, that means agricultural/ecological and technical methods. But still more important is the fact that number of hazardeous birdstrikes decreased during the same period although the number of movements and flight hours increased between 1967 and 1976.

The statistics show(Figure 2) that coastal airfields have

by ecological reasons a higher quantity of birds than highland airfields. Therefore without provisions scaring birds the coastal airfields would have the highest number of strikes. Nevertheless figure 2 shows that it is possible to reduce birds in such airfields in case a corresponding(regarding the ecological background) method of grassland handling can be developed. So in the first years the grassland was mowed nearly monthly, the consequence : a large population of gulls, oystercatchers and starlings during all seasons, a high number and a high rate of birdstrikes. Reducing number of mowingtimes from 1968 until 1970 led to a decreasing number of strikes, the mowed grass was removed. In 1971 a test was made by 6 times mowing, the result was clear. Since 1972 the grassland procedure for this airfield with very poor soils ,on which growth prohibiting substances are not favourable is to mow two time the year with removing the material. The birdstrike number and rate during those years was 0; in 1976 there happened 1 strike, induced by a small bird - without damage.

Another example : an airfields in NW-Germany amidst a pasture landscape in the surrounding. Also on this airfield permanent mowing led to an increasing of lapwing and gull as well as during special periods starling population. The best results as to the birdstrike number could be reached by using growth prohibiting substances(Fig.3) MH 30 , but because of the type and nutrient situation of the soils it is only possible to use this substance for 3 years maximum. The figure 3 shows that mowing always led to an increasing birdstrike number. Bird observations on the same airfield showed that quantity of birds decreased in years with use of MH 30 because of the longer grass. The same happens in years with two times cutting with removal of grass.

In figure 4 there is presented the birdstrike statictic of an airfield with large agricultural use in the surrounding and a high fertility of soil. A permanent cutting - 6 - 8 x per year - favours appearance of birds especially lapwings, starlings, pigeons,crows and hawks because of quantity of

small animals in the soil which could develop by the not removed grass-material. Using the growth prohibiting substance MH 30(Malein-acid-hydracide) together with mowing (late autumn or early spring as a cleaning mowing) the bird population could be reduced and number of birdstrikes decreased; birds migrated back into the agricultural areas for food. The picks in 1970 and 1972 had to be traced back to the fact that one part of the airfield (100 ha) along the runway was mowed all over the year and the other part(100 ha along the runway) was mowed only two times the year. For this airfield in western German area the best method consists in using MH 30 for 3 years, than one year with two times mowing with the aim to recover the grass from this chemical substance. Generally it should be regarded that use of MH 30 is dependent on soil fertility and density of grassland-species. In order to find out the best intervalls it always will be necessary to test out this substance and its concentration regarding soill and precipitation.

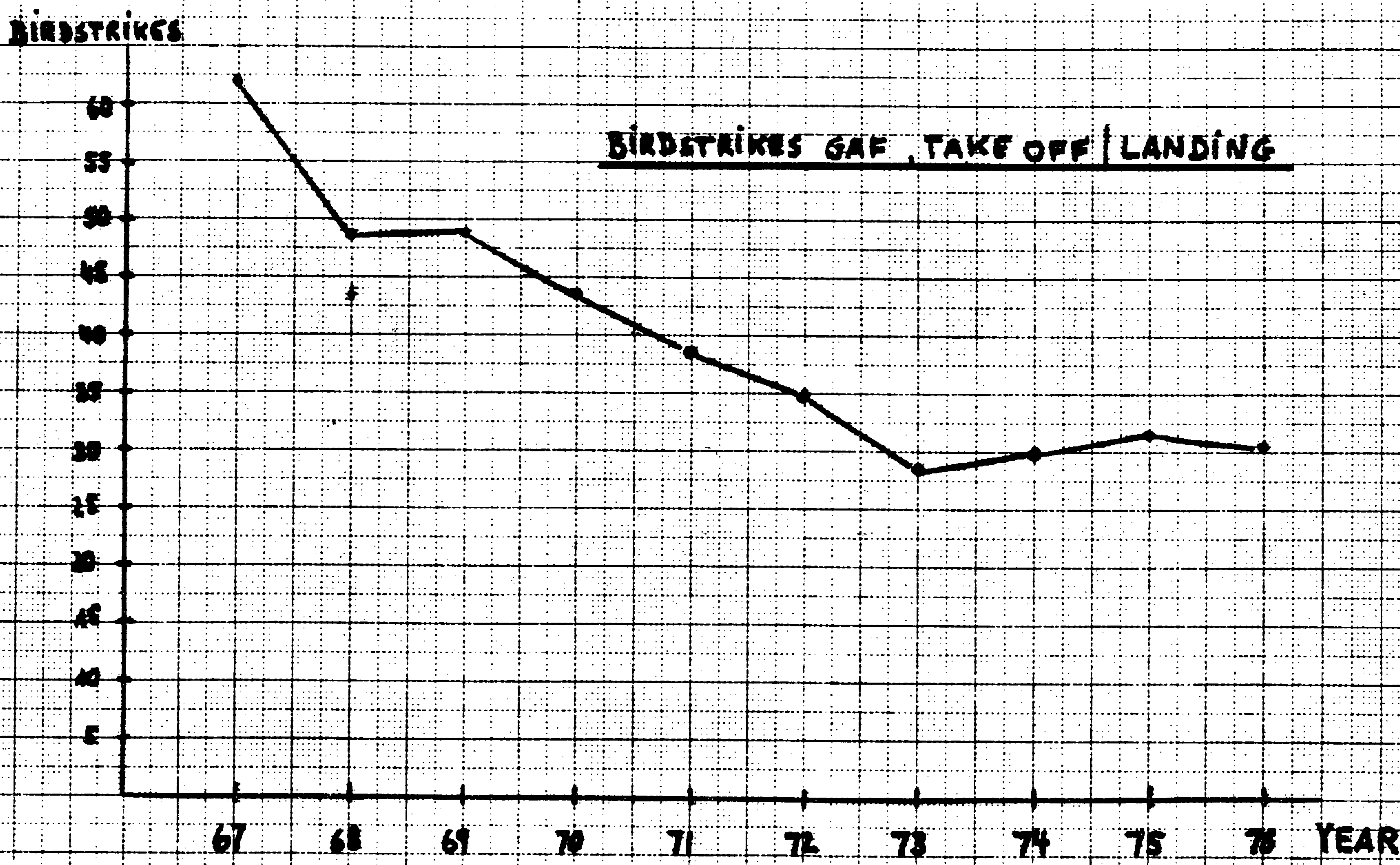
The last figure 5 shows the situation on an airfield with strong agricultural use.The bird population consists on crows,pigeons, starlings and hawks. More than 200 ha are in cultivation , and that wheat, rye, oats and barley. There seems to be a difference between years with cultivation of wheat and rye as well as with oats and barley as wheat and rye are preferred by birds. The second difference is between cultivation corn or root vegetable like potatoes and rape. Root vegetable seems to be more attractive for pigeons,gulls and crows, corn attracts small birds and crows as well as hawks. This may declare the difference in the figure 5: many birdstrikes in years with cultivation of corn, fewer strikes in years with roots. The relative numbers of birdstrikes from 1974 until 1977 show the same.Since 1 year the agricultural area has been reduced for more than 90 %, the number of birds decreased as well as the number of birdstrikes.

4. <u>Summary</u>

Agricultural and intensive grassland use favour quantitity of birds and can induce birdstrikes on airfields. The results presented in this paper should be seen also under the viewpoint that besides special ecological provisions - use of grassland,

use of chemical substances, change of vegetation-type and -form - also technical provisions were carried out, but comparing the results reached by technical and/or ecological procedures it must be stated that the ecological way seems to be the best for reduction of bird populations as well as for elimination the birdstrike risk.

FIG. : 1

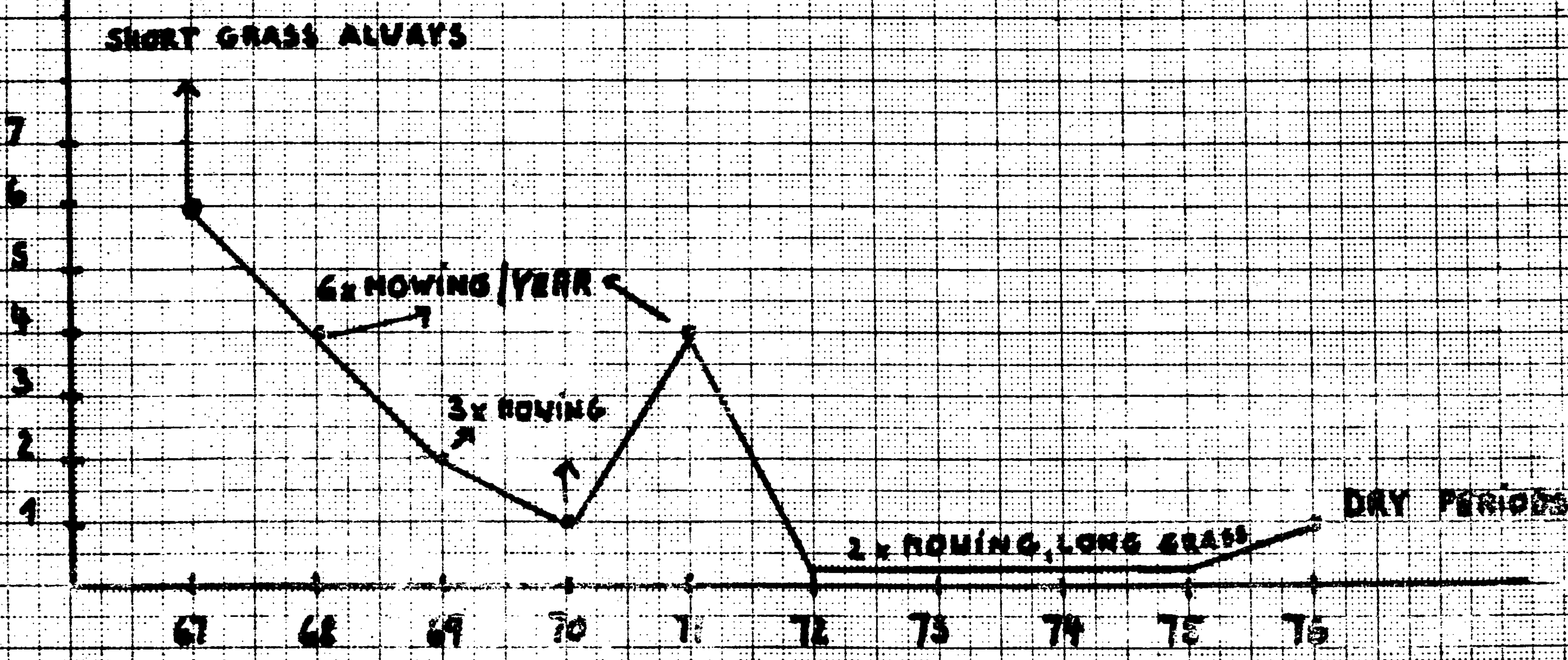

BIRDSTRIKES GAF , TAKE OFF | LANDING
BIRDSTRIKES
60
55
50
45
40
35
30
25
20
15
10
5
67
68
69
70
71
72
73
74
75
76
YEAR

417

FIG. 2

BIRDSTRIKES AIRFIELD COAST AND GRASSLAND USE

(GULLS, LAPWINGS, STARLINGS)



218

FIG. 3

BIRDSTRIKES AIRFIELD NW-GERMANY AND GRASSLAND USE

(LAPWINGS, GULLS, SMALL BIRDS)

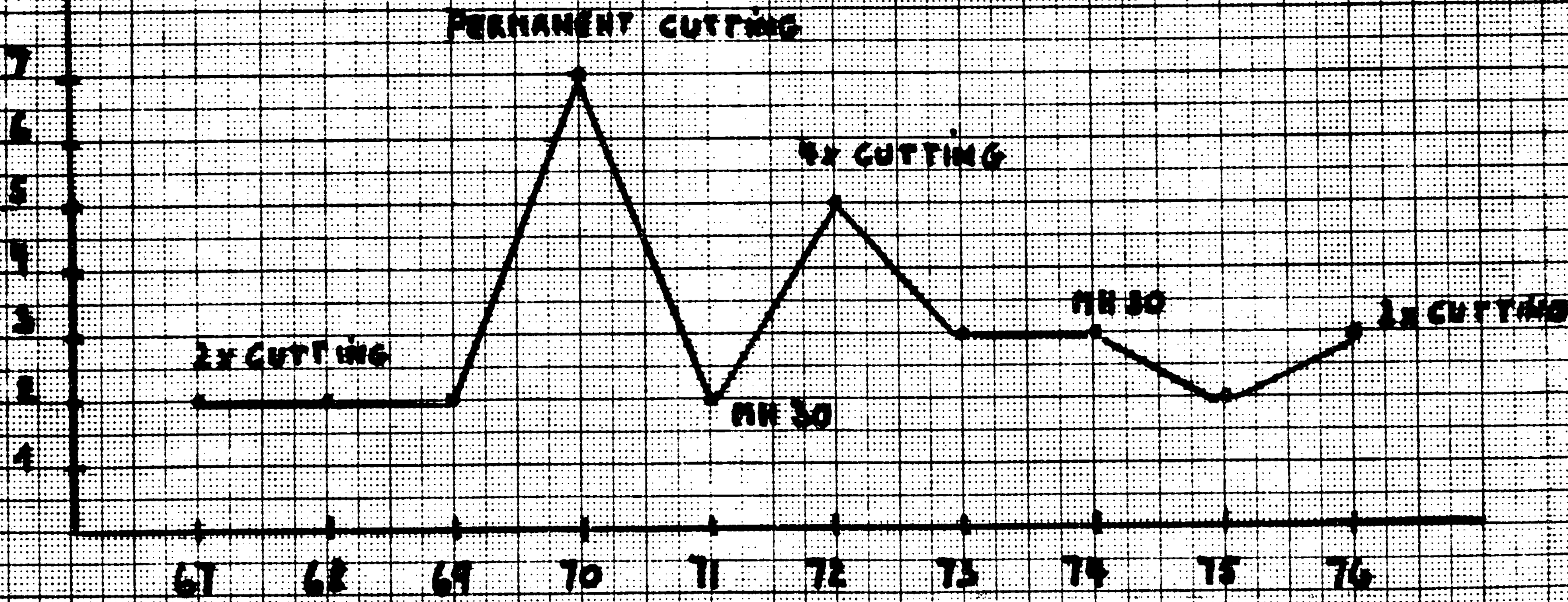
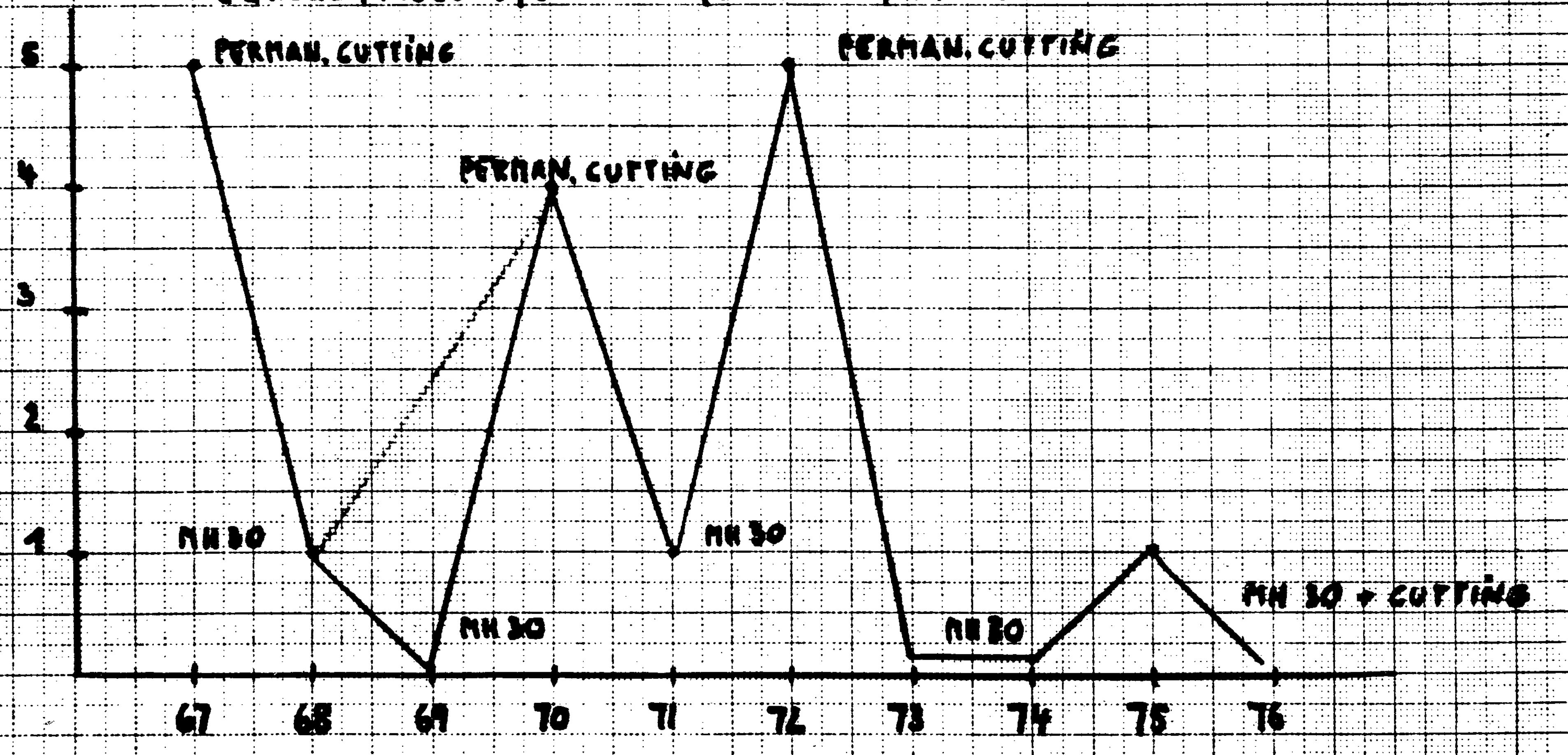


Fig. 4

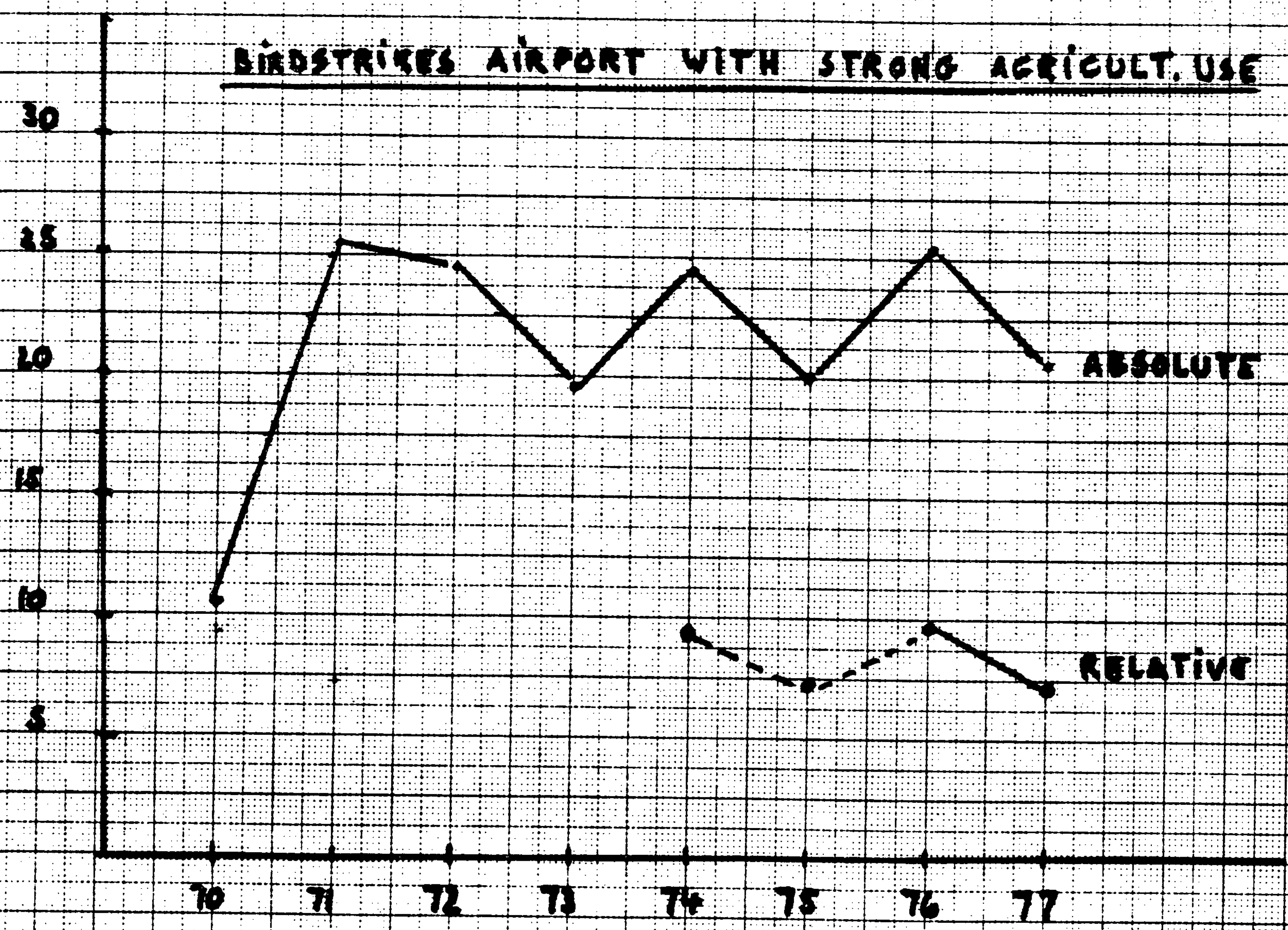
BIRDSTRIKES AIRFIELD IN AGRICULTURAL AREA

(CROWS, PIGEONS, STERLINGS, LAPWINGS, HAWKS)



220

Fig. 5


BIRDSTRIKES AIRPORT WITH STRONG AGRICULT. USE
30
25
20
15
10
5
70
71
72
73
74
75
76
77
ABSOLUTE
RELATIVE

221

Discussion on WP 14

The chairman asked working group aerodrome to further study WP 14.
This was accepted.

Hild showed a German film with comments in English:

and Ferry showed a French film:

Both films were very instructive and were received with applause by the audience.

APPROACHES TO PROTECT ENDANGERED AREAS ON AIRPORTS FROM BIRD POPULATION BY XIRONET (R) BIRD PROTECTION NETTING

Introduction

The purpose of this presentation is to put forward some ideas on the use and application of Xironet (R) nettings against birds on airports.

On a seminar, which took place in 1976 at the Bowling Green University in Ohio USA it was said that the first recorded bird strike accident was in 1912, when a gull got caught in an aircraft control cable. The pilot was killed in the crash. Since that first squaring-off, man and bird have been engaged in an accelerating contest in which there can be no winner.

At first, birdstrikes were not really much of a problem. Aircraft were slow, and birds were able to learn to move out of their paths in time to avoid a collision. But, with the coming of the jet age, the problem began to take on more sinister proportions. At this point, birds ceased to be a minor annoyance and became instead a serious hazard to the safe operation of aircraft.

Xiro Inc. is a manufacturer of plastic films and nettings and started some years ago to develop a netting which was inexpensive enough to be spread over large crops or cultures. Mainly the more expensive type of cultures such as vineyards, cherries, berries, seed production in certain areas are under permanent danger from bird damage. Although a wide choice of nettings existed already, it was until today not possible to fully cover the crops as the cost/yield ratio was not satifactory for the farmer.

Application of Xironet today

The following slides should offer an impression of how Xironet bird protection netting is used and applied today.

Xironet is supplied in rolls of 100 cm width, wherefrom the material is unrolled. The netting is expansible up to 8 or 10 metres. The required laying width can be chosen according to the given circumstances. The glittering linkage points and the yellow colour of the netting are providing a permanent scare effect.

Today Xironet in Europe has become the number one bird protection netting in Agriculture, in Wine Growing for large area protection. For instance in Switzerland we have covered last year approximately 10% of the total wine production surface.

AD F616130

When we heard about the bird problems you have to face in airport control, we thought it would be worthwhile making an attempt in order to find out the possibilities to control birds on airports with Xironet bird protection netting.

As we have had only a few weeks time to investigate various possibilities, we have chosen the small Airport Belpmoos (Belp near Berne) to do some practical work and prepare alternatives, to be presented today.

Proposals of application methods on airports with Xironet(R)

We have been trying to find methods which will prevent birds from flying in and land on the areas nearby the runways. There are 3 ideas which we would like to demonstrate more detailed and you will find the proposals on the following pictures:

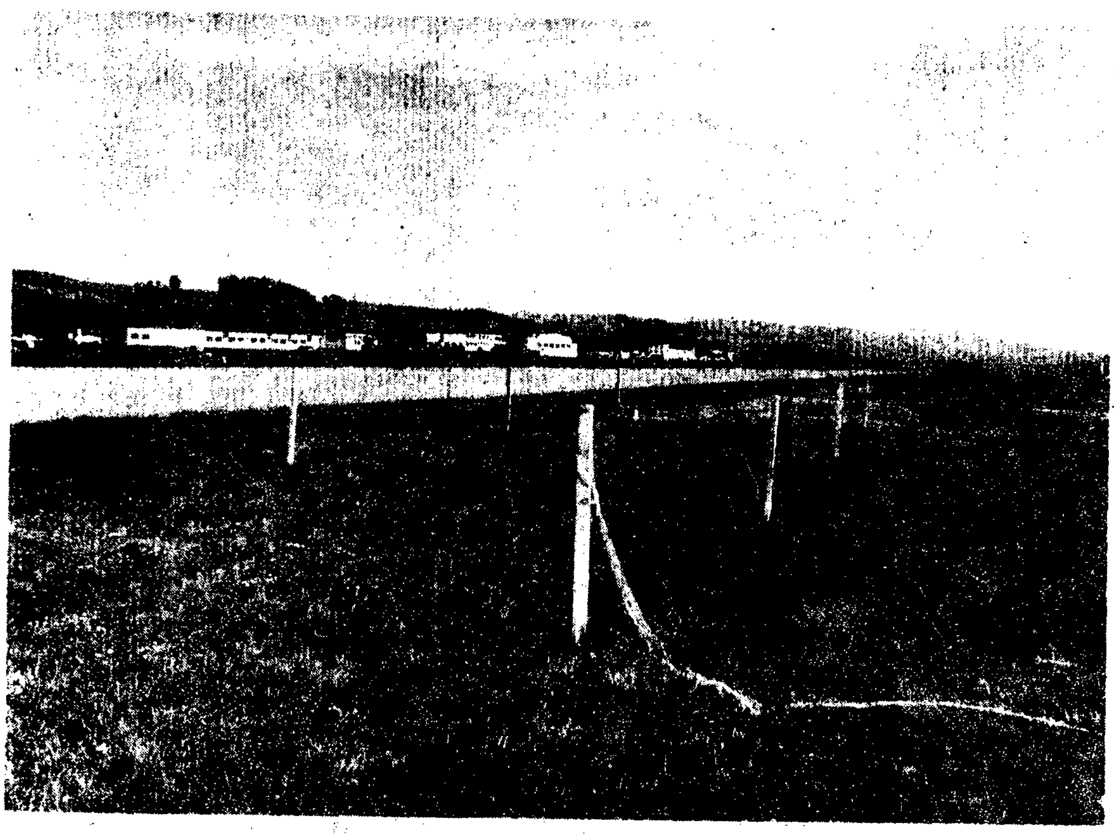
1. Xironet laid flat on the ground

   The net is being unrolled from the original roll (width 100 cm), expanded up to the required width and laid over the ground. Small hooks help to fix the net on the ground. This will stop the net from moving when aircraft start or land.

The net is laid easily and quickly on the ground, quickly fixed and easily removed.

2. Net fixed on piles at a distance of approximately 8 m and fixed on the ground

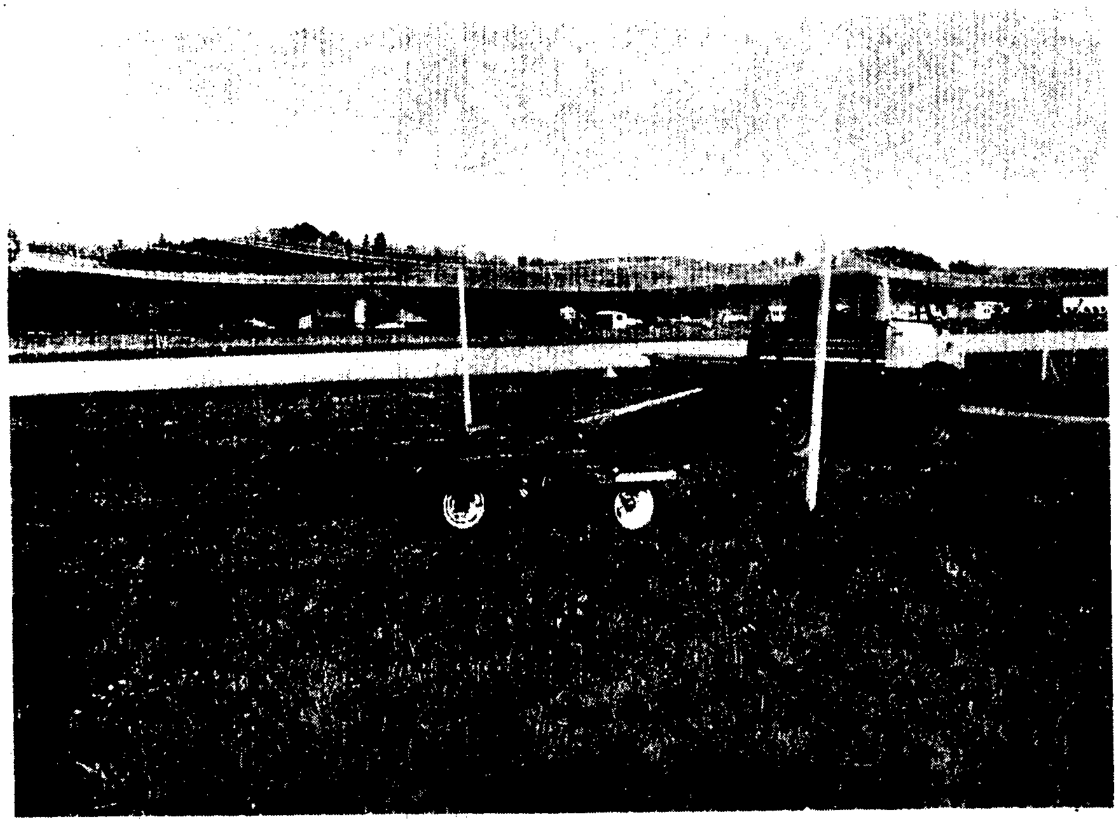
The idea was to build up a sort of a "shed type roofing". The distance from one row to the next row was chosen in a way that it would not be possible for birds to land from either side.



This system offers the advantage that once an infrastructure is built up, it can always be reused. Part of the lawn could be mown without removing netting or piles.

3. Roof covering

We built a structure of approximately 2,20 m high piles and placed the net over the piles to form a total flat roof. The open sides and ends could be completely closed. With this system the lawn can permanently be mown and birds have no chance to enter and to land. Wherever an infrastructure owing to safety reasons cannot be mounted, this system may not be feasible.



Where we have bushes, marshy ground or other obstacles, populated by birds, the netting can just be spread over the area, such as it is done over cherry trees, vineyards or other crops. The required technical equipment to cover relatively high bushes is normally available on airports. From the enclosed sample you will be able to find out yourself how easily the material can be expanded and placed over the area to be protected.

Summary

From agriculture we have learnt that netting is the most useful and valuable mean to protect crops against brid damage. The proposals demonstrated were attempts to show alternativeuses of nettings on airports.

There, it is even more important that an endangered area can be protected in a short time and the material eventually removed just as quickly.

Compared with other bird scare methods, netting seems to be the only method to work satisfactorily. Netting provides the physical barrier to keep birds out. It is reported that other systems fail, as birds get accustomed. Furthermore, this physical netting barrier has a price level, which makes the application worthwhile. In Europe a hectare of bird protection netting (wine, berries, etc.) will cost approximately SFr. 800.-- not including the cost for the labour of laying.

As the protection methods could be adapted to the local requirements, Xironet should add up to the already known protection means as a very valuable and save system.

If you have proposals or questions to put forward, we shall be pleased to discuss the same.

M. Herzig/ms
XIRO AG FRIBOURG
29.5.1978

XIRO AG
Chemin Riedlé 13
Postfach 30

CH-1700 FRIBOURG 7

Tel. 037 / 22 44 23
Telex 36380

Continous work with the migratory bird forecasting system presented at BSCE12/WWC3

Bertil Larsson
Meteorologist
Sweden

ABSTRACT

As the results from the introduction of a bird warning system in 1977 were rather good we are going to run another experimental period this year. If the results still are good (or better than last year) this forecasting model is going to be used in a permanent bird warning system in the future.

The model for the sea-flying birds was not good enough so we are going to change it using more representative countings collected at the east coast of Sweden (instead of countings made at Falsterbo used in the first model).

We are also changing the threshold for warning/no-warning in order to issue warnings for "very hot" areas only. The forecast period this year is going to be 1 August to 15 November.

In a preliminary analysis it seems to be fewer collisions with damage to the airplane during the forecasting period 1977 than during the same period the years before.

Discussion on WP 16

Larsson (after the presentation of his paper): So far we have not extensively evaluated the value of the forecasting system but we are going to do so next autumn.

Boomans: Do the forecasts always have about the same accuracy in the same weathersituation?

Larsson: We have not studied that so far. The variation of the number of birds ready for migration is doing such an evaluation difficult.

Boomans: Do you issue one forecast a day?

Larsson: Yes, but we also prepare a preliminary forecast in the afternoon of the day before.

Turesson informed that an evaluation of the value of the forecasting system for civil aviation is planned to be done after the end of next autumn's concluding period of trials.

Large scale weather situations and influence on bird migration during seasons of the year

Report gviven by Dr.J.Hild,GAF, 5580 Traben-Trarbach,Mont Royal

During the last years Denmark, Sweden and Swisserland tried to get informations about relationships between weather parameters and bird migration. They developed special modells with the aim to forecast birdstrike-risk and bird movements over medium and longer periods.
In Germany with its different geomorphological and therefore also climatological conditions it seemed very difficult to make such forecasts based on such models as weather in the various regions - German Bight, Highland,Alpes - is too different.Therefore we used an other way : we found out 11 standardised weather situations and tried to correlate it with bird migrations intensities and frequencies. These weather situations are the following:

Anticyclone Central Europe(AC)	Fig.1
Anticyclone Western Europe(AW)	Fig.2
Anticyclone Southern Europe(AS)	Fig.3
Anticyclone Eastern Europe(AE)	Fig.4
Anticyclone Northern Europe(AN)	Fig.5
Cyclone Western Europe (CW)	Fig.6
Cyclone Southern Europe(CS)	Fig.7
Cyclone Eastern Europe (CE)	Fig.8
Cyclone Northern Europe(CN)	Fig.9
Trough Western Europe(TRW)	Fig.10
Trough Eastern Europe(TRE)	Fig.11

The reason for this subdivision was that in some times or seasons for the northern German district an antycyclone over northern Europe with its various meteorological parameters was important for bird migration whereas in western Germany migration was influenced by a trough and southern Germany was standing under cyclone influence. Therefore the migratory situation in the different regions could not be comparable.

The trial for correlation was done as follows : about 30.000 bird observations(1966-1974) - radar and visual observations - were transfered on videoscan document and stored on a data tape of a computer. Weather reports of selected weather stations

as well as large scale weather situations were added to the data tape. A special program, called "bird oberservation", produced the desired correlation between bird migration and large scale weather situation.

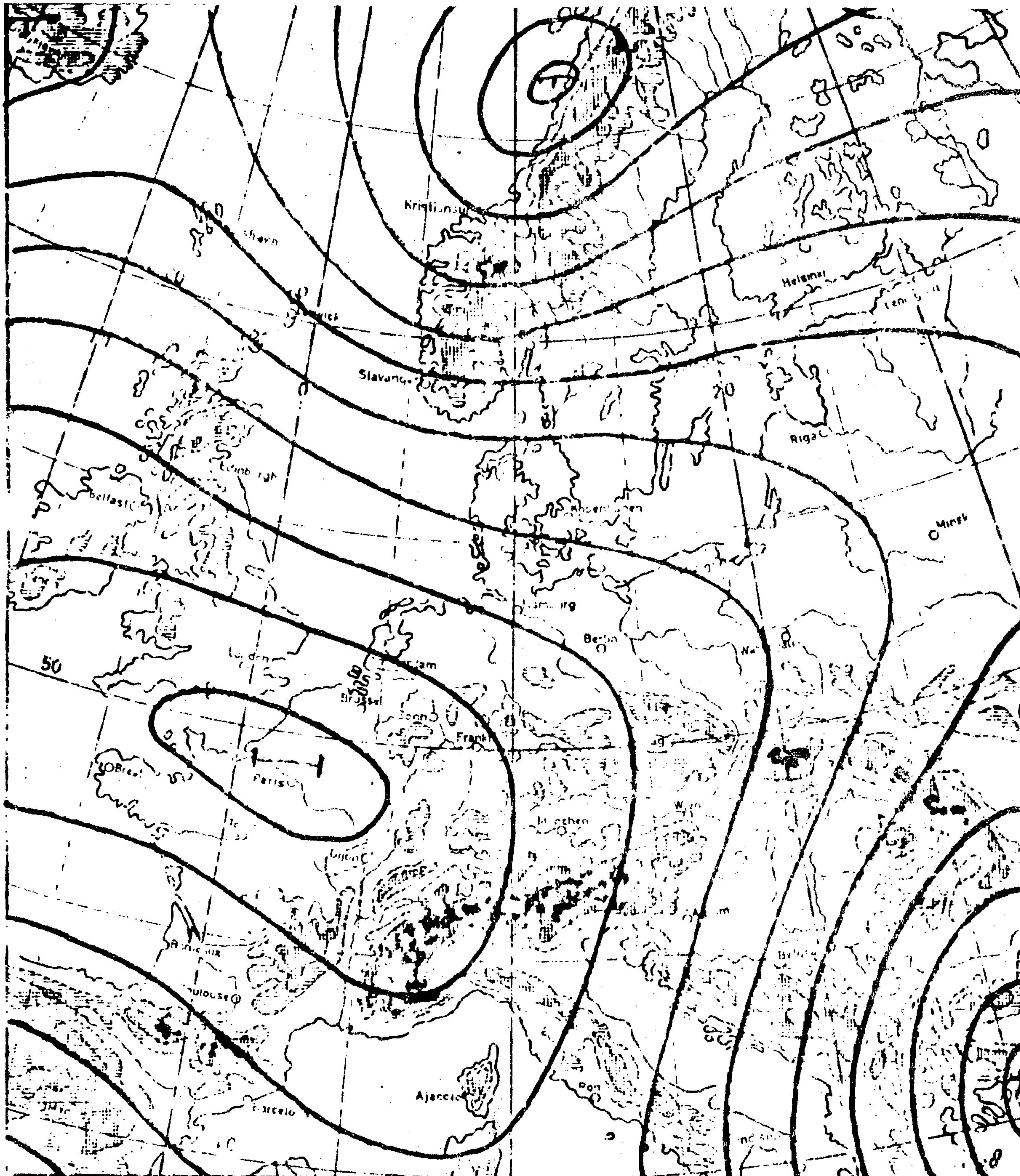
Figure 12 "Occurence of Birds" shows the distribution of bird observations on various large scale weather situations in per-cent, here f.i. in february 1966 until 1974, a period with the first pre-spring migration. Weather situations with southern or western air currents seemed to be prefered. This figure gives no information about the frequency of the weather situations during this months and therefore the result could be accidentally. So the next figure 13 "Bird migration and large scale weather" regards this frequency for february. The method to get a relative number as relative quantity of birds was the following: frequency of birds during a large scale weather situation in per cent divided by frequency of occuring large scale weather situations in per cent. The result in fig.13 is an other one than in fig.12, for only anticyclone over southern Europe and trough over western Europe favoured spring migration whereas all other situations had no remarkable influence on bird movements. That proofs that especially westerly and southwesterly airflows with mild temperatures favour bird migration during this period.

An other example may show the situation in the month june over 9 years. The figure 14 shows only occurence of birds in per cent; an anticyclone over West- and cyclones over West- and North Europe seem to stimulate bird migration. The figure 15 confirms more or less this result. By the a.m. weather situations with their characteristic parameters the so-called inter-migration in early summertime is favoured.
On this way we shall try in future , too, to get a good background for forecasting bird movements in the different parts of our country.

[illegible] H [illegible] Uhr (z) Dienststelle:

AC

Fig. 1



Wetterlage vom: H / W Uhr (z) Dienststelle:

Fig. 2

AW

Wetterlage vom: Uhr (z) Dienststelle:

AS

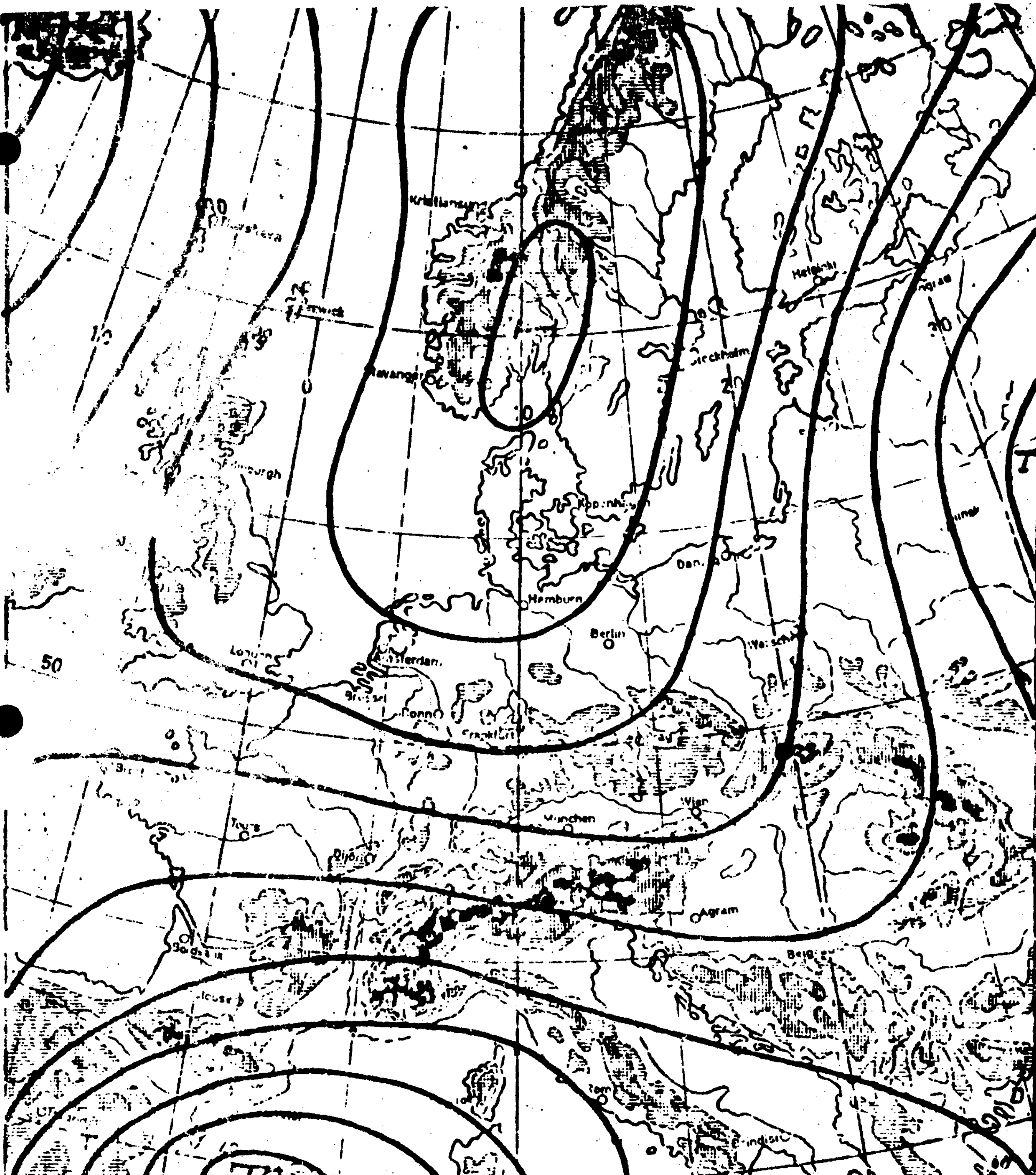
Fig. 3

237

Wetterlage vom: / / Uhr (z) Dienststelle:

AE

Fig. 4



Wetterlage vom: *HN* **Uhr (z) Dienststelle:**

AN

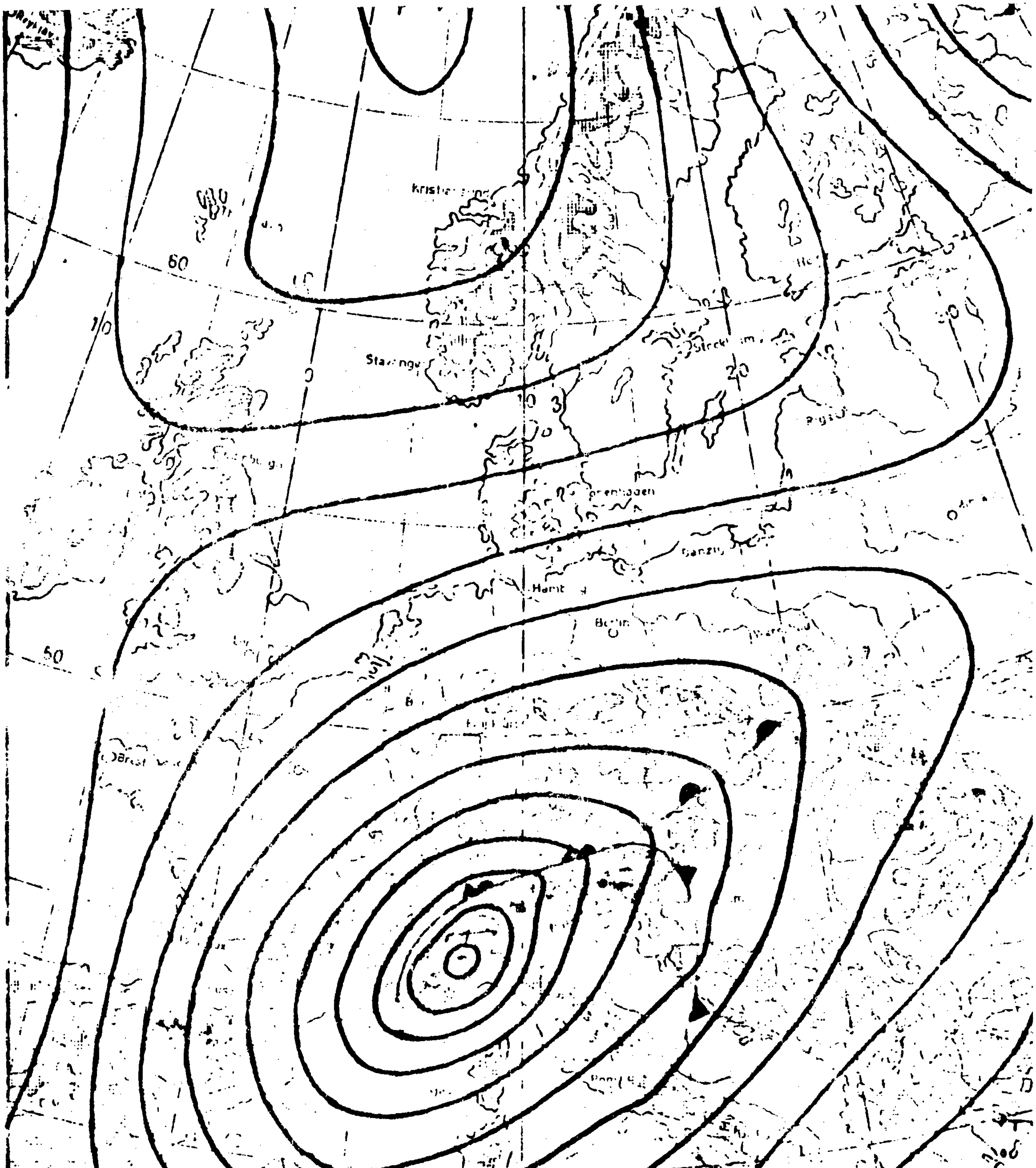
Fig. 5

236

Wetterlage vom: 7 w   Uhr(z) Dienststelle:

GW

Fig. 6

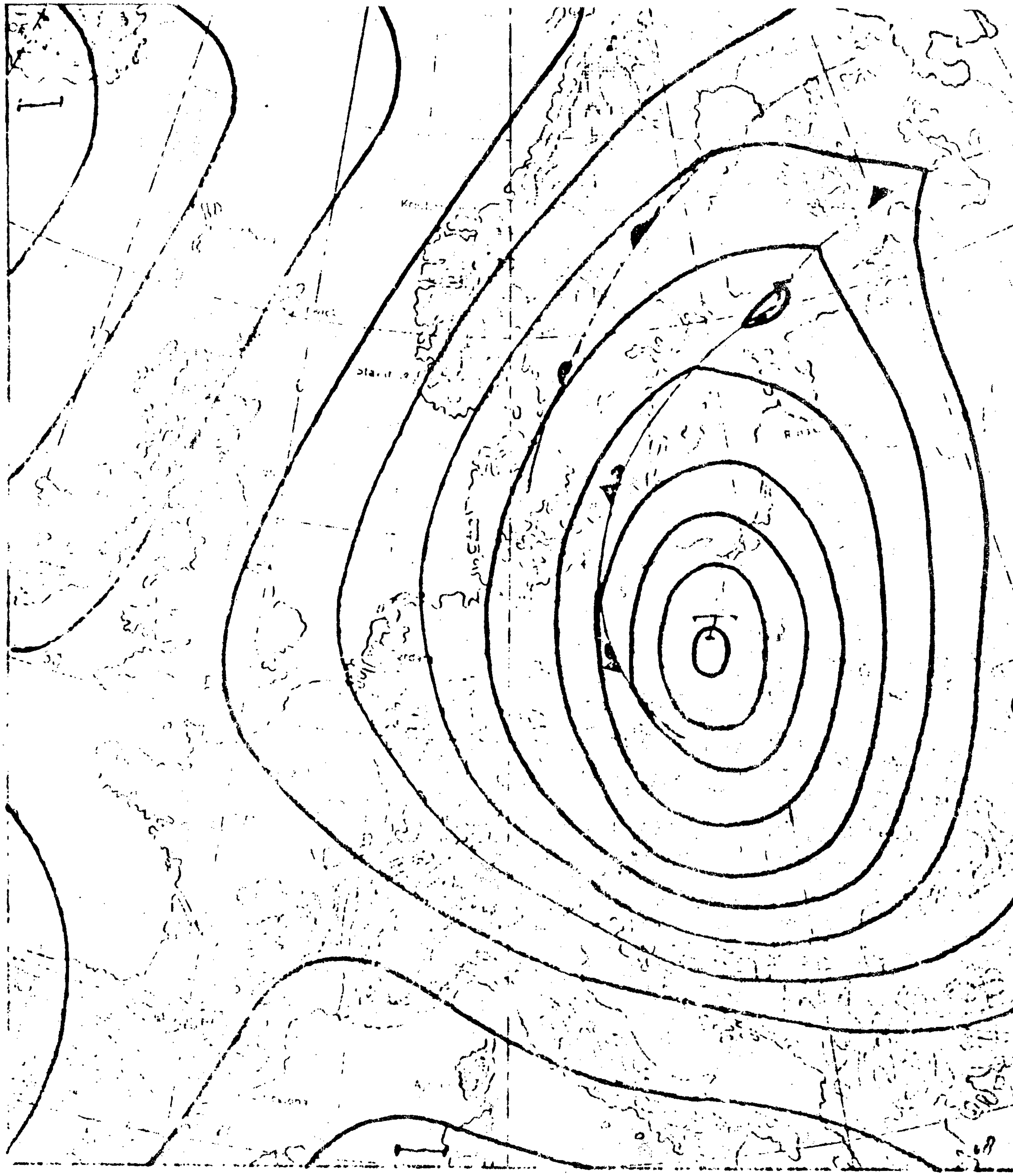


Wetterlage vom 7 S Uhr (Z) Dienststelle:

CS

Fig. 7

238

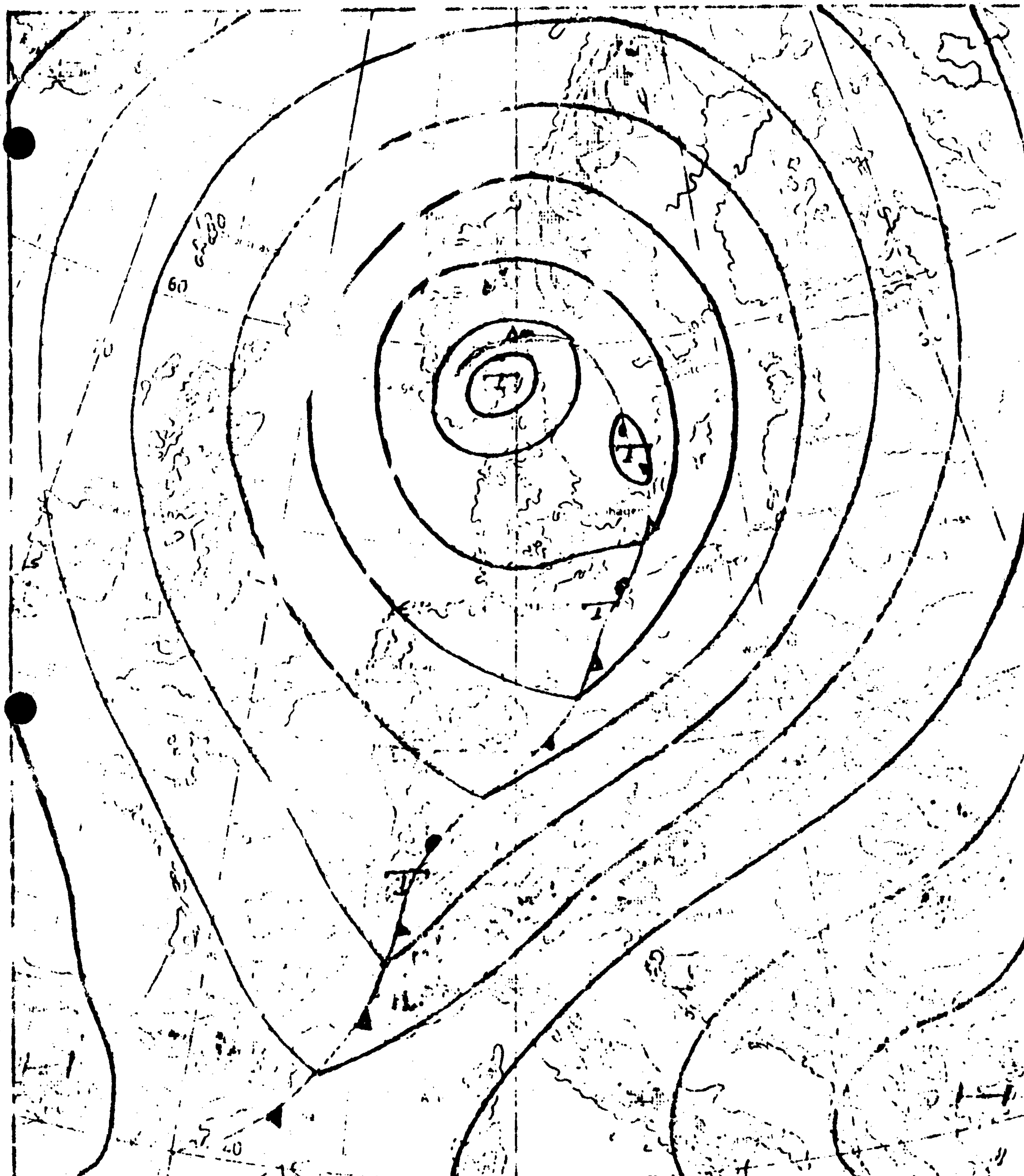


Wetterlage vom: 7 L

Am (z) Dienststelle:

GE

Fig. 8

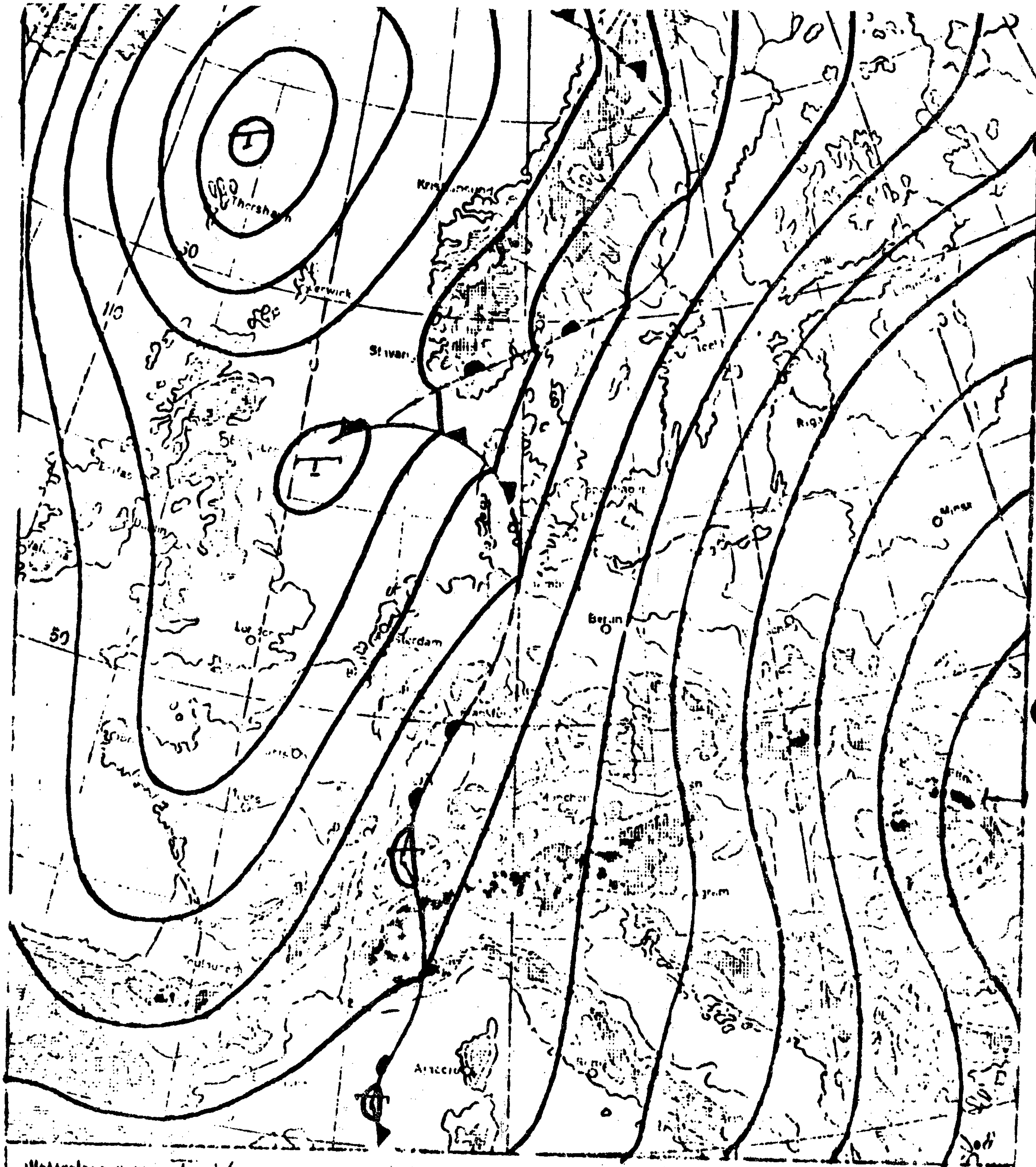


Wetterkarte vom: T N   Dir (z) Dienststelle:

GN

Fig. 9

240

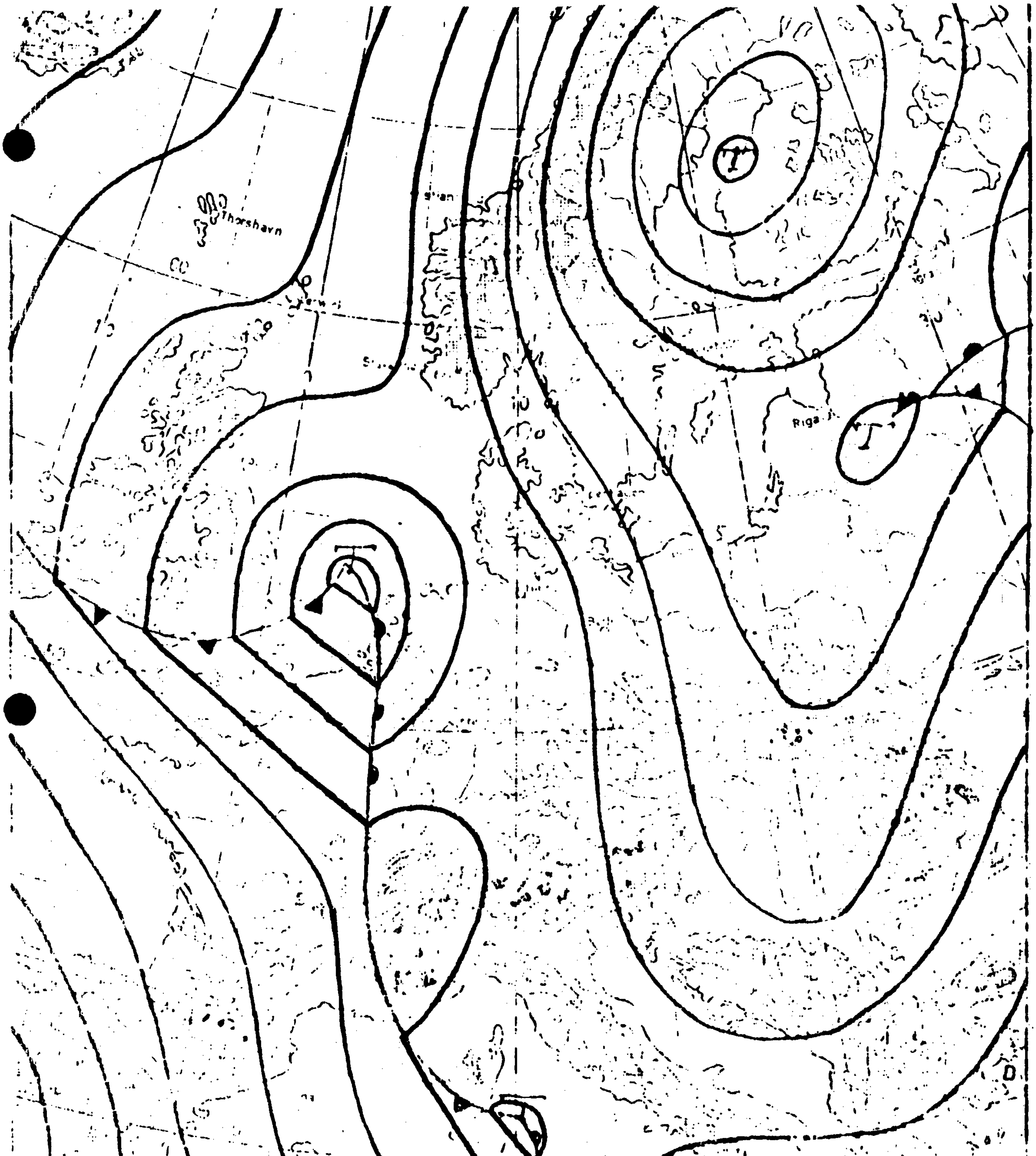


Wetterlage vom: Tr W Dienststelle:

TRW

Fig. 10

7 41



Wetterlage vom: ... Uhr (Z) Dienststelle:

TRE

Fig. 11

Fig. 12

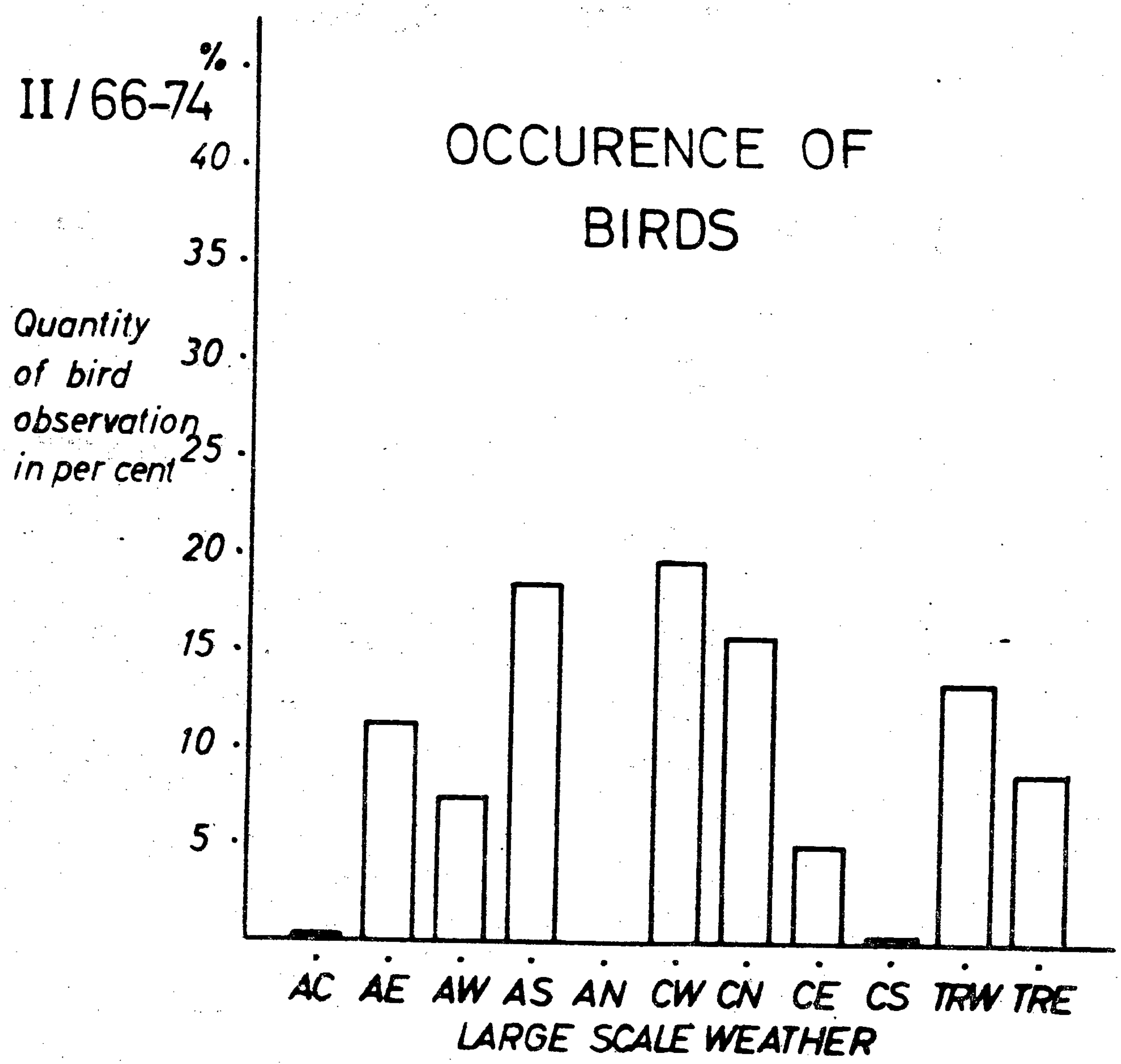
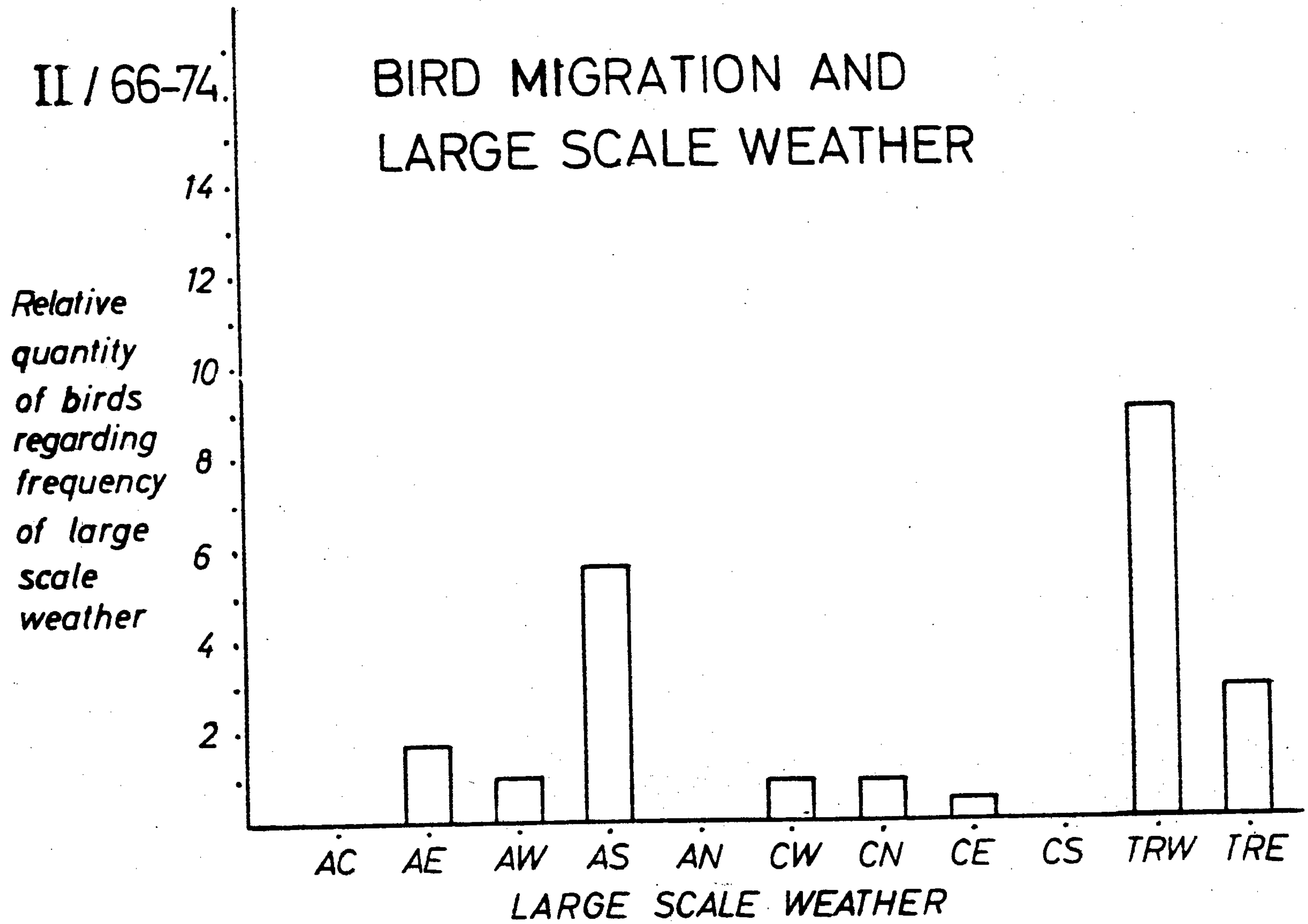

II/66-74
OCCURENCE OF BIRDS
%
40
35
30
25
20
15
10
5
Quantity of bird observation in per cent
AC AE AW AS AN CW CN CE CS TRW TRE
LARGE SCALE WEATHER

Fig. 13



II / 66-74.
BIRD MIGRATION AND
LARGE SCALE WEATHER
Relative quantity of birds regarding frequency of large scale weather
14
12
10
8
6
4
2
AC
AE
AW
AS
AN
CW
CN
CE
CS
TRW
TRE
LARGE SCALE WEATHER

Fig. 14

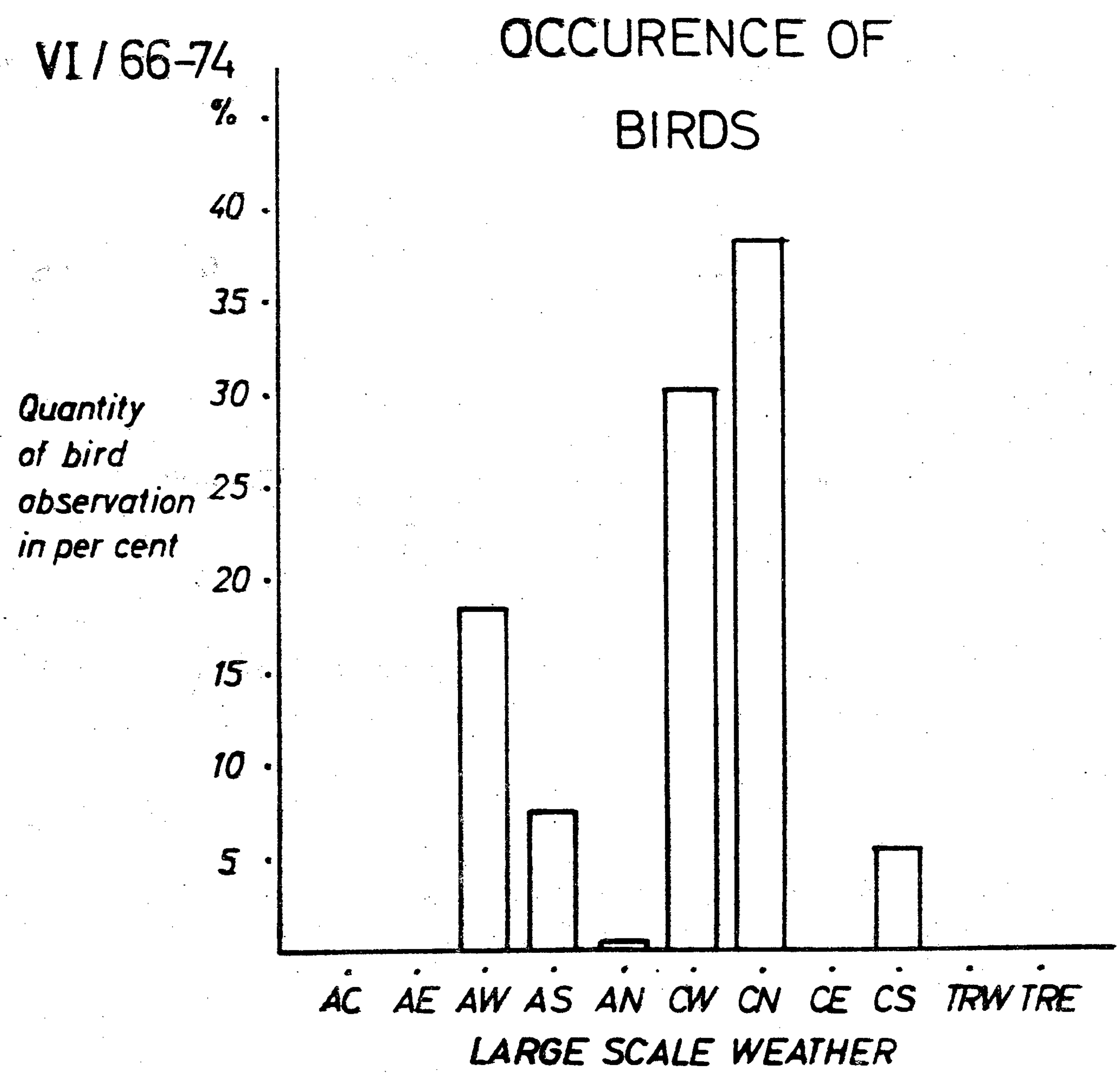
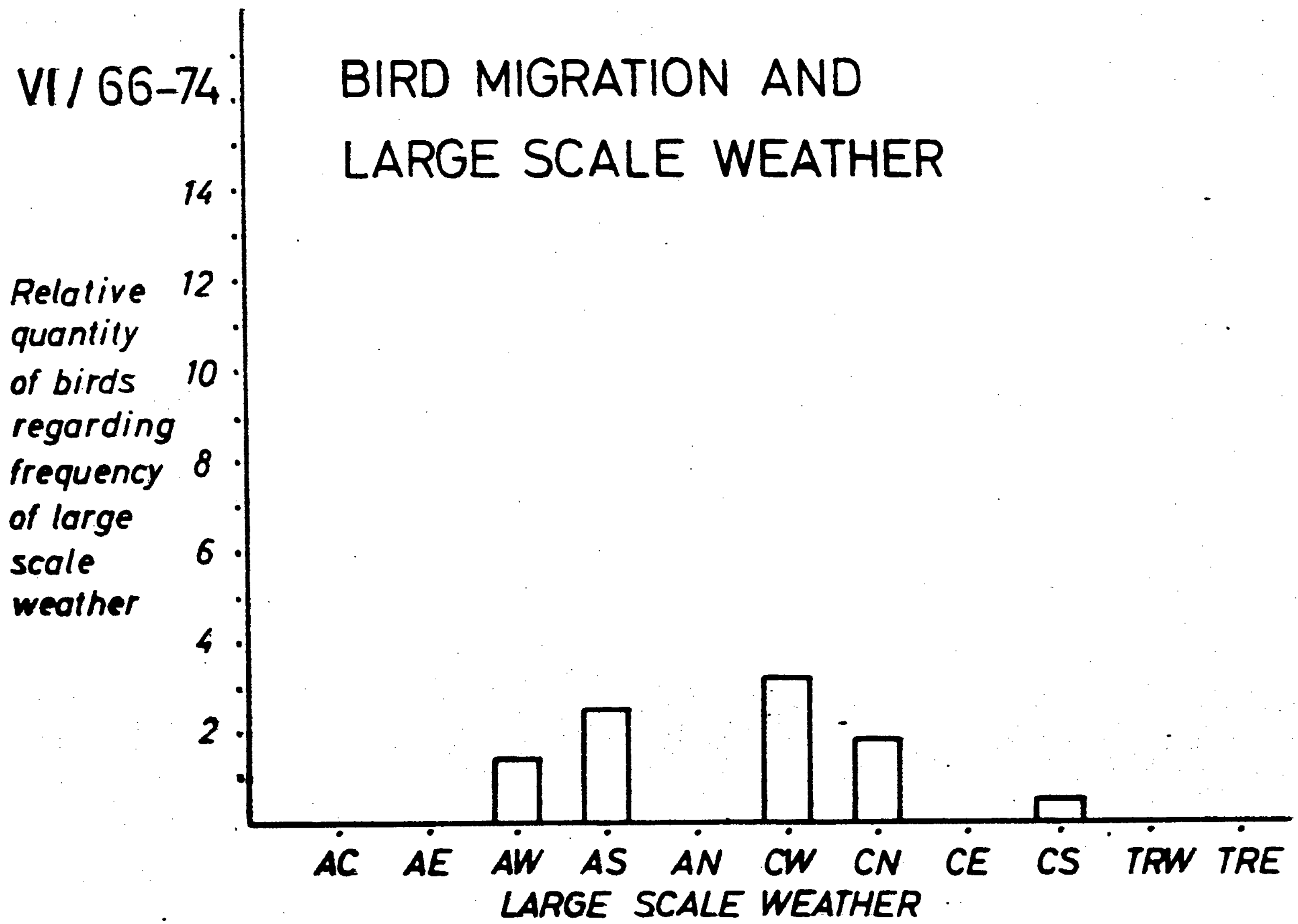

VI / 66-74
OCCURENCE OF
BIRDS
%
40
35
30
25
20
15
10
5
Quantity
of bird
observation
in per cent
AC AE AW AS AN CW CN CE CS TRW TRE
LARGE SCALE WEATHER

Fig. 15


VI / 66-74
BIRD MIGRATION AND
LARGE SCALE WEATHER
Relative quantity of birds regarding frequency of large scale weather
14
12
10
8
6
4
2
AC
AE
AW
AS
AN
CW
CN
CE
CS
TRW
TRE
LARGE SCALE WEATHER

Discussion on WP 17

Larsson: Have you carried out forecasts based on the material now presented?

Hild: Yes, we do so and sometimes also tendency analysis in order to supplement the forecasts.

Larsson: How great is the efficiency?

Hild: 60-80 %. I can also mention that we issue special forecasts for the crane migration with a validity of 48 hours.

Pierre: Is it possible to study birds migration with the aid of satellite pictures?

Hild: The scale of the satellite photos is of such an order that studies of the migration will probably be difficult.

Larsson: I think such studies will be possible.

BIRD OBSERVATIONS AT ZURICH AIRPORT

by Bruno Bruderer, Switzerland

Abstract

During the years 1971, 1972 and 1973 hobby-ornithologists among the airport personnel (meteorologists, firemen, policemen and others) have collected data on the distribution of the most hazardous bird species within the confines of Zurich Airport. The data gathered by these non-specialists in a fairly unsystematic way have furnished a heterogeneous sample. It is the aim of the present paper to show possibilities of evaluation, presentation and use of such data.

BIRD OBSERVATIONS AT ZURICH AIRPORT

by Bruno Bruderer, Switzerland

Introduction

Bird censuses revealing the number, species and distribution of birds on an airfield serve for decisions about the methods to keep these birds away. In order to get a regular survey over all seasons one ought to employ a biologist (a half-day job would be enough for two airfields not too far away from each other). However, it is often difficult to get the money or the appropriate man for such a job, and one is obliged to work with hobby-ornithologists among the airport personnel. Observations by firemen, policemen, meteorologists and others with changing schedule and intensity of their work cannot be as systematic as professional observations. The resulting data are occasional in time and space. The question is, if and how we can evaluate and use such heterogeneous material.

Since this problem may arise in different countries, the present paper tries to show the limits and possibilities of treating such incomplete data.

Methods and material

An instruction course for people interested in bird observations at Zurich Airport was held in early 1971. During this half-day course a booklet summarizing the aims and the methods of observation and depicting the most important bird species was distributed. Exercises in filling out report forms were carried out.

The report forms contained on one side a map of the airport, on which the way of the excursion or the surveyed area as well as the location of the observed birds could be indicated. On the other side of the form the time of observation, meteorological conditions, groundcover, the number, species, and behaviour of the birds were asked.

At the end of 1973 more than 300 report forms with an average of 10 observations were available. Some of them contained excursions covering the whole airfield, some represented a series of excursions in one or two sectors of

the airfield during a week. Usually there were single excursions in one sector (cf. Fig. 1a). A few contributions comprised single reports on conspicuous birds or flocks. So the chance for a large bird or flock to be reported was somewhat higher than that of smaller ones, and the number of "excursions" is not absolutely identical for all the species (cf. the total number of excursions indicated in the upper right-hand corner of the distribution maps). The number of excursion indicated in the graph for the pheasant corresponds practically to the basic number of excursions without additional observations (the difference to the other species is obviously small).

The aims to be attained :

1) to show graphically the distribution and flock size of the most hazardous species

2) to show the seasonal changes in this distribution

3) to explain, if possible, distributions and seasonal fluctuations with respect to the habitat

4) the first ideas for the project also included the description of fluctuations throughout the day and under different meteorological conditions. However, this is only possible, provided that an equal number of data is available for the times and situations to be described.

   This point was excluded as soon as we knew that the observations could not be executed on a regular schedule.

Presentation of data (requirements and possibilities)

1) Horizontal distribution on a limited number of easily legible maps (for the most important species)

   Possibilities :

   a) Indication of the preferred areas and the three most frequent flock sizes (in numbers) within these areas (no exact locations, but estimation of the average number of birds present)

   b) Signatures for three categories of flock sizes at correct location (no indication of the number of birds present at a certain time)

   We chose possibility b), plus an indication of the average number of birds present (in an additional graph in the upper right-hand corner of each map).

2) Seasonal fluctuations in number and distribution of birds :

Possibilities :

a) Provided that equal data are available for the four seasons and for all sectors, a map for each season would be the best.

b) If the excursions are unequally distributed over the year, it is necessary to indicate the number of excursions per season; and if the different parts of the airport are unequally covered, the number of excursions per sector must be indicated.

Forced by the quality of the data we had to decide for possibility b). The solution chosen is explained in Fig. 1a :

- The area of the airport was divided into five sectors (A to E) according to the areas usually treated as a unit by the observers.
- For each sector (in each season) the number of excursions is indicated as points.
- Below the number of excursions the percentage of positive statements is given (5 points indicating that on 25 % of the excursions the species in question was observed).
- The columns represent the three most frequent numbers of individuals observed in the sector referred to. The thickness of the upper limit of the two to three elements of a column indicates how often numbers of the corresponding size have been observed.

3) Correlation with habitat (cf. Fig. 2c)

Bird data of three years had been pooled together, therefore, by necessity the habitat data have been pooled as well.

The extension of grassland (hatched) was fairly constant; the same was true for some of the cereal areas (coarse points). In certain areas the cereals alternated with rapes or legumes (fine points).

Results

The number of points for the excursions shows that autumn has the best coverage of observations; B was the most visited sector, while sector E was not very attractive. These differences in mind, it is evident that we should consult the distribution maps always in connection with the

graphs showing average numbers of birds present, number of excursions, and percentage of excursions with observations of the species in question.

In order to show how to read the graphs, we will discuss the first species (Corvus corone, Fig. 1b) in detail, while for the following species we only emphasize the principal facts.

Carrion crow (Corvus corone, Fig. 1b)

The distribution map shows five main features :

- large flocks on the grassland to the north of the main runway
- medium flocks on the arable land along the main runway
- medium flocks (combined with small flocks and single birds) at the end of each runway
- many observations of single birds or small groups, especially in sector B
- more observations in sector B than in others (caused by the preference of a very active observer for this sector).

The total number of excursions shows :

- a bad coverage of sectors A and E in winter and spring, a good coverage of A and B in summer, and all sectors with a good sample in autumn.

The percentage of excursions with positive statement shows :

- Crows are usually seen on more than 50 % of the excursions (only buzzards have a higher chance to be observed).

The columns indicate :

- crows are usually present as pairs (or singly)
- another large number of observations refers to groups of 5 to 20 birds
- in spring there are only small groups present
- beginning in late summer and as a usual feature in autumn there are flocks of 20 to 60 birds
- occasionally there are large flocks (concentrated during winter in sector D).

Explanation with respect to habitat and special comments of the observers :

- in spring there is a territorial pair at the end of each runway and two or three pairs along the main runway. Towards the end of May the young

appeared in addition to the adults and some of the families joined each other (groups of 5 to 20 birds !) The central part of the main runway is preferred because of woodlands on both sides;

- in summer and autumn there is a certain influx of birds from the surroundings especially during harvest periods or when recently ploughed fields offer additional food supply;
- large flocks invade the airfield when food supply is exceptional with respect to the surroundings; that is especially in winter, when natural fertilizer is brought out (sector D !).

Ringnecked Pheasant (Phasianus colchicus, Fig. 1c)

Most observations are concentrated in sectors B and C; the species is not regularly observed. During spring and summer, single birds or very small groups; in autumn and winter, groups of 3 to 10, rarely more birds are observed.

The preference for sectors B and C is caused by woodlands and bushes coming close to the airfield on both sides.

Common Buzzard (Buteo buteo, Fig. 1d)

The Common Buzzard occurs all over the airport area and throughout the year in comparable numbers (1 to 3 individuals per sector, rarely 5 or more). Its regular occurrence is due to a good population of mice (which attracts also a lot of owls). The concentration of points in sector B is rather due to a large number of excursions than to a denser population of buzzards.

Lapwing (Vanellus vanellus, Fig. 2a)

30 to 40 pairs of Lapwings are breeding in the arable land around the central crossing of the runways. Sheep grazing on the grassland improves the food supply to the north of the airfield and the marsh areas NE and SW of the airport are additional feeding places. The undisturbed area of the airport is used as a resting and moulting place : in autumn and early winter, a total of 200 to 300 individuals occurs in the airport area.

Ducks (anatidae, Fig. 2b)

Ducks are not regular visitors of the airfield.

During summer there are only single pairs feeding in the wettest areas

(sectors B and D). The same sectors are preferred in the other seasons; when the grassland or the empty fields are wet by rain or melting snow, flocks of more than 50 birds may occur, in winter even more than 100.

Black-headed Gull (Larus ridibundus, Fig. 2 d)

In spite of the high number of collisions between aircrafts and gulls at Zurich Airport (cf. Bruderer 1972 and Bruderer 1976), gulls do not regularly occur on the airfield. Less than 50 % of the excursions show the presence of gulls. However, when they are present they build up large flocks and they are more prone to fly up when an aircraft approaches than crows. Most of the large flocks were observed in autumn and winter in the sectors A, B and D. Grassland with natural fertilizer, recently ploughed or harvested fields are preferred.

Conclusions

According to these results, natural fertilizers and sheep grazing have been forbidden within the confines of the airport. Cultivation of cereals will be reduced as far as long-term contracts with the farmers allow, and scaring methods for gulls are in use.

Other proposals were : to shoot as many pheasants as possible, to control the mice population, and to drain the wet areas.

Acknowledgments

I wish to thank the hobby-ornithologist who has done the fieldwork, Mr E. Sagne, the local coordinator for the bird strike problem, for his excellent collaboration and my colleague R. Furrer, for the correction of the English text.

References

Bruderer, B. (1972) : Some statements and some questions to the bird-problem at Zurich airport. 7th Meeting of Bird Strike Committee Europe. - London, vervielfältigt zu Händen der Mitglieder.

Bruderer, B. (1976) : Daten zum Vogelschlagproblem in der Schweiz. Angew. Ornith. 5, 1-12.

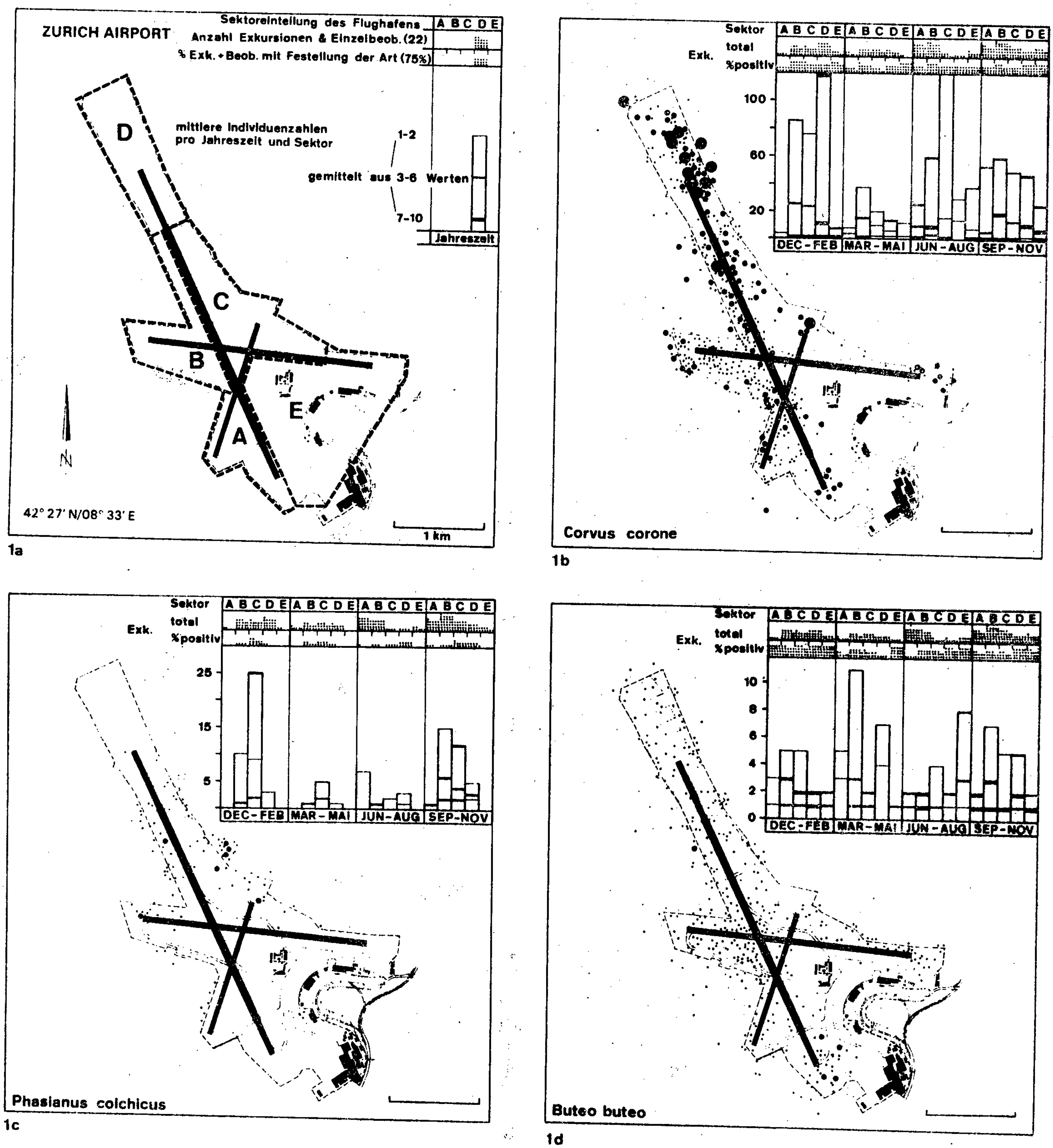


Fig. 1 : a) observation sectors in the airport area; explanation of signatures for number of excursions, percentage of positive statements, average number of birds present (cf. text); b) distribution of Carrion Crow; c) Pheasant; d) Common Buzzard

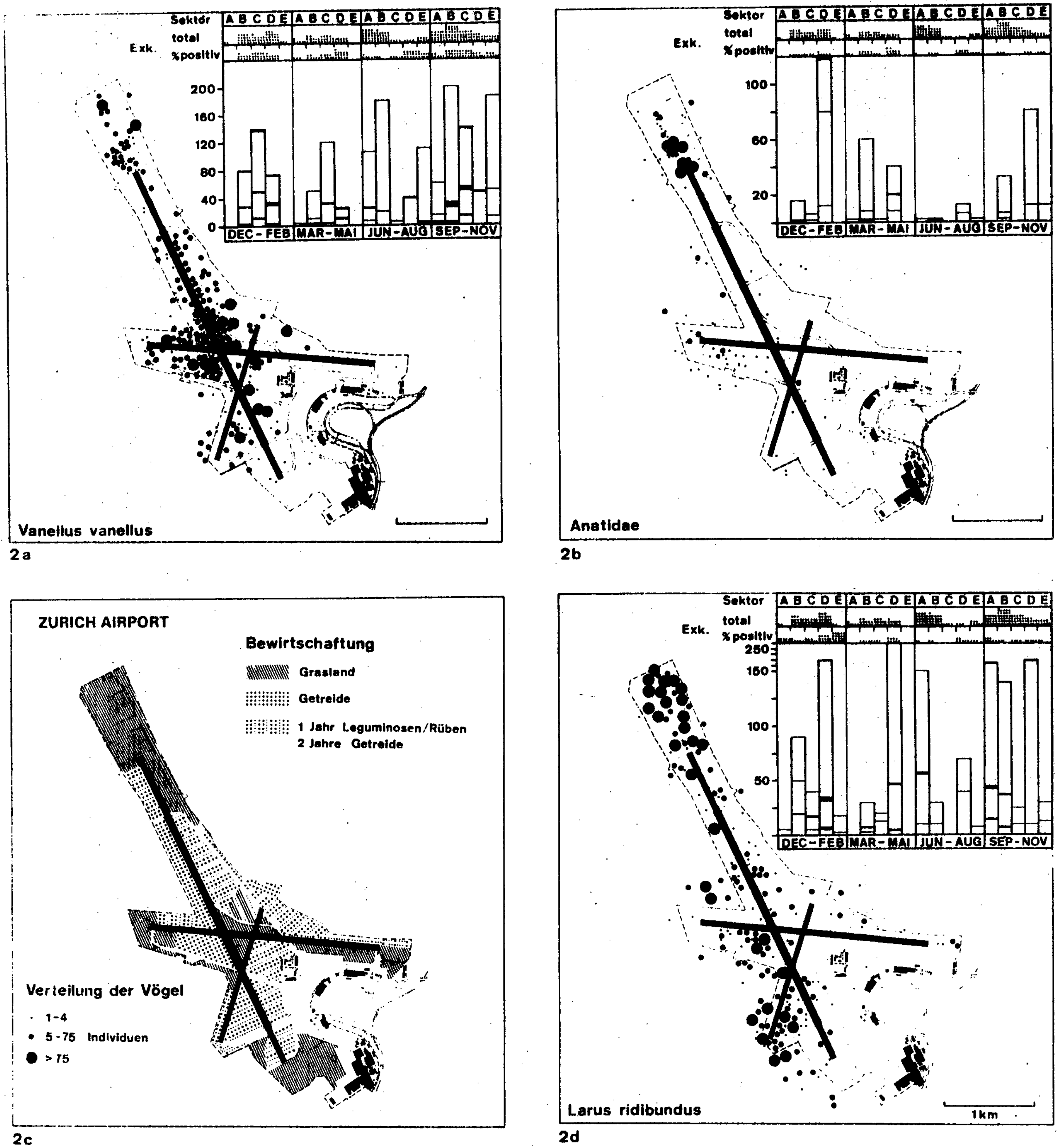


Fig. 2 : a) Distribution of Lapwings; b) Ducks; d) Black-headed Gulls; c) use of land on the airfield during the years 1971-1973 (further explanation, see text).

Roosting and feeding flights of Black-headed gulls (Larus ridibundus) in the region of Zurich airport

compiled by Werner Suter
on behalf of the youth group of the ALA

1. Introduction

In 1975 the youth group of the ALA (Swiss society for bird study and bird protection), started investigations on the Black-headed gulls (Larus ridibundus) wintering in the Zurich area.

As their roosting place, the lower part of Lake Zurich is a center of that winter population. In the daytime most of the gulls disperse over a large area, mainly to the north of the roosting place for feeding. A considerable number stays at the lake and in the city where the birds are fed by people.

Since Black-headed gulls are often considered as problem birds, the investigation produced some useful results with respect to agricultural and aviation problems. This paper deals mainly with the aspects of interaction between birds and aviation. We wish to thank B. Bruderer and R.K. Furrer for many advices and critical review of this text.

2. Material and methods

2.1. Numbers of wintering gulls

The size of the winter population can be estimated quite accurately by counting the birds arriving at the roost on lower Lake Zurich in the evening and by counting those gulls staying at the lake during the day. Counts are now available for the last three winters (1975/76-77/78). Comparisons with earlier counts allow to quantify the population trend.

2.2. Recruiting area of the roosting place

We were then interested in the size of the recruiting area, i.e. the area used for feeding by the gulls during the day. For this purpose we used the surveillance radar at Zurich airport and we also trapped and colour-marked a large number of gulls.

- Surveillance radar (10 cm): Films from late autumn 1963 were interpreted, gull movements were followed directly on the screen during the last three winters and new pictures were made with a 36 mm - camera. Apart from the

ADF616134

determination of the feeding area, the morning and evening movements' dependence on topography and weather was revealed.

- Colour marking: We trapped nearly 1000 Black-headed gulls with a cannon net (13 x 27 m) at the shore of Lake Zurich in the winter of 1977/78 (following pilot studies in the previous winter). The birds were ringed and additionally coloured at different parts of the body. We used yellow and orange picrid and picramic acid (colours to catch the observer's eye) on some parts of the body as well as special bird marking paint for contrasting collars (showing the marking date in combination with different patterns of the body-colour).

2.3. Behaviour at the feeding place

A study area of 33,2 km^2 (80 % cultivated) was selected north of Zurich airport; it was surveyed on 25 days during winter 1977/78 by driving along the same route at about the same daytime. All gulls were counted and their location and activity was determined.

3. Results

The data have not yet been fully analyzed; the following is therefore only a provisional interpretation of the material.

3.1. Numbers and phenology of the wintering gulls

The average number of gulls wintering in the Zurich area and counted at the roosting place varies between 17'000 and 20'000 birds. Numbers build up very rapidly in October; at the end of the month already some 13'000 are present. At this time many passage migrants are probably still included; a small peak in November gives some evidence for it. Highest numbers are reached in mid to end of January with 18'000 to 22'000 birds. Numbers decrease very quickly in February; at the beginning of March some 10'000 gulls are still in the area. Although considerable passage is probable in spring, no further peak can be recognised.

3.2. Recruiting area of the roosting place

The whole feeding area of these gulls has an extent of about 1400 km^2, whereas the main part visited by the birds comprises some 800 km^2. Most of the birds go to feed on meadows and arable land, mainly in the lowlands (under 450 m) of the northwestern canton of Zurich (where the airport is situated too). The average distances flown from the roosting place are 10 - 20 km, but the

largest ones reach 40 km. Apart from these, a remarkable number of gulls spends the day at the lake and is fed by the public. The number of these "urban gulls" remains rather constant between 2500 - 3000 from December to February; another 500 - 1000 gulls populate the sections of the Limmat river in the center of the city near the lake. Considerable numbers are also found along the other river sections (Limmat, Sihl and Schanzengraben). The flocks in the city itself (mainly in the suburbs) which get their food also directly from people, should not be neglected as well. These numbers can only be estimated and may reach some 5000. The remaining 9'000 - 12'000 gulls in midwinter fly daily out to the fields for feeding. At the beginning and end of the winter the corresponding numbers are lower.

3.3. Feeding and roosting flights

3.3.1. Flyways

On their feeding and roosting flights, gulls follow the larger valleys and the plains without forests. They like to follow guiding lines like rivers or edges of valleys. Even narrow curves of rivers are often followed. They refrain from flying over large forests and prefer to make detours instead. Chains of hills are crossed at unwooded passes, mostly below 600 meters. The additional flying distances caused by this behaviour are generally 3 - 5 km, i.e. an addition of about 20 - 30 % to the shortest route; in extreme cases the detours may reach up to 15 km, i.e. more than 200 % of the shortest possible way (e.g. flying around the Albis hill chain)(see figures).

3.3.2. Height of flights

After starting from the feeding or roosting place the birds rise very slowly. First, they fly about 100 m above ground, further away (ca. 10 km) from the starting point some 200 m, and at larger distances from the starting point they reach sometimes 400 m.

3.3.3. Influence of the weather

Feeding on cultivated land is possible only when the soil is not frozen. For this reason, the mild winters of the last years were favourable for the gulls. Snow cover also lowers the feeding efficiency. Feeding flights to farmland are reduced under such bad conditions, more gulls stay around the lake and in the city or along rivers outside of the city (rivers Limmat, Glatt...). Continuous rainfalls over a long time may have the same effect, by reducing flight activity. Even short-term weather fluctuations influence the behaviour

of the gulls: an approaching heavy rain or thunderstorm front may cause the gulls to leave their feeding places in a hurry Visibility, particularly sight contact with the ground seems to be of great importance: light mist makes the gulls fly very low, dense fog makes them reduce or stop the feeding flights.

3.4. Adhesion to the feeding place

Numbers of birds counted weekly in the study area (see 2.3.) fluctuated markedly between 119 and 2994 around a mean of 1234 (sd = 734). This fact represents well the short-time fluctuations of food supply: snow-covered or frozen soil prevents feeding, damp or wet soil favours it. Farming activities also influence gull dispersion: recently ploughed fields are attractive. Nevertheless, gulls can be found more constantly in some parts of the study area than in others. Only few observations exist on the fidelity to a feeding place. Unfortunately, individual marking of the birds was impossible. Colour combinations showed only the marking date. At some places birds with the same combination were found several times, but no clear sequence of observations concerning identically coloured birds exists. Arguments for a possible adhesion of single birds or groups to certain feeding places are very weak of lacking.

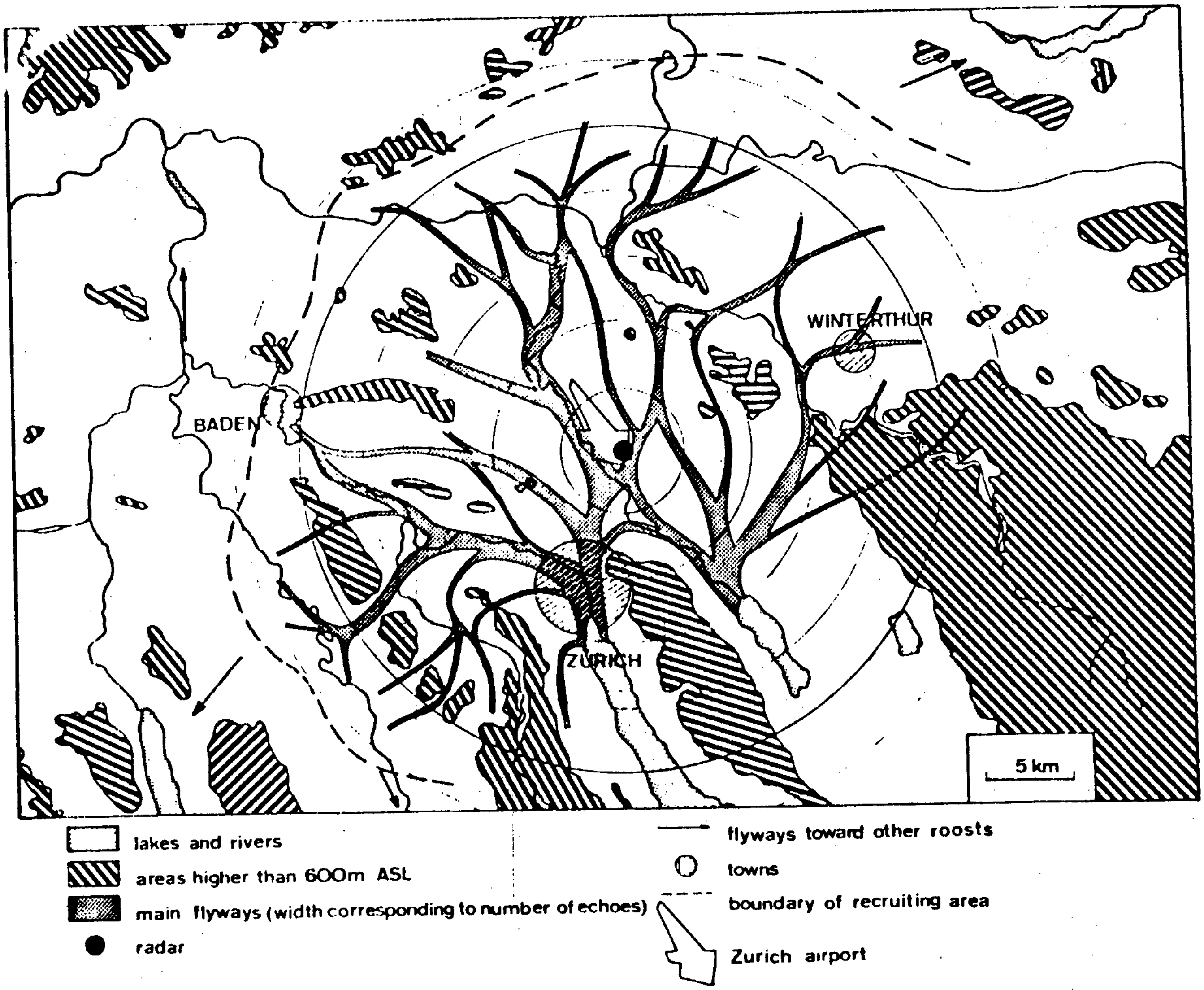
3.5. Other movements of marked birds

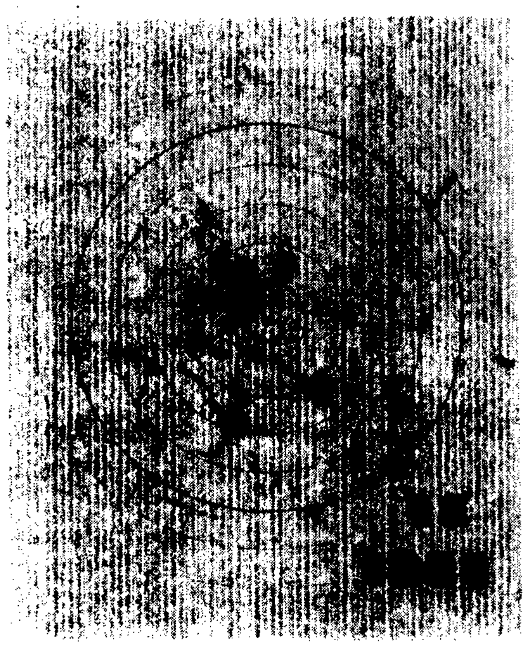
Sight records came also from outside the normal dispersal range of the roost. From the reports which reached us, the marking date of 28 records could be fixed exactly, that of an other eleven records only approximately (whith an uncertainty of 4 or 7 days). During the course of the winter the time span between marking and first sighting in regions of other roosts decreased (indication of increasing migratory movements?). Changing from one roost to another or departure can take place very rapidly: a gull marked in the evening of 7.12.77 in Zurich was already seen at a roost at the Lake of Constance near Eschenz one day later (42 km NE). Another bird marked on 17. or 21.12.77 was observed near Basle on 26.12.77 (some 70 km WNW) and a further gull of the same marking date was in Munich (West Germany) already on 9.1.78 (about 250 km NE).

4. Discussion

For the bird strike problem, mainly observations on feeding and roosting flights and on a possible feeding site fidelity may have some significance.

It seems that only the roosting place is a site that is frequented more or less constantly. Visits to the feeding places depend on weather conditions, food supply, and other factors; no habituation can be assumed. This should facilitate measures for gull expulsion from the airport. However, the area of Zurich airport will remain attractive for gulls (and other species, like Lapwings Vanellus vanellus) as long as there are short-grass meadows and arable fields. The same is true for military airports, e.g. Duebendorf airport, which are also situated in the range of well visited feeding areas. Black-headed gulls maintain also a certain conservativism in choosing the flyways from and to feeding areas. More detailed studies are necessary in order to establish the exact time-table, activity rhythm and flight altitudes of the gulls. The potential risk at the crossing points of the birds' flyways with aircrafts in final approach or climb out has to be estimated.





Roosting gulls on 1o cm radar at Zurich airport, 1o November 1976, 1638 h. The distance between two circles is two Miles (as in the map above)

Biophenological observation- and information service in GAF, a help for birdstrike-risk forecast

Report given by Dr.J.Hild,GAF,558 Traben-Trarbach,Mont Royal

Statistic investigation about birdstrikeshad the result that on military aircraft most incidents/accidents happened in low level and only 20 - 30 % on the airfields or in the surrounding of the airfields. Moreover statistics show that also during summer- and wintertime birdstrikes occur. These are the facts. During main migration periods in spring and autumn it is possible to observe bird migration by radar and to publish birdtam or forecasts; on airfields it is possible to scare birds by ecological and technical provisions/equipments, but in the surrounding of the airfields it is impossible to do anything.

There are two questions which must be answered : 1. Why migrate birds in summer and winter, what areas will they prefer and why;the answer : in summer migratory movements may be a function of density of population and a function of food; birds prefer areas with intensive agricultural use; in winter migratory flights can be induced by weather - frost-periods - but also by food. 2. Why and when bird appear in the surrounding of an airfield and possibly visit the airfield for a short time for nesting or feeding !? The answer: birds appear in these districts if the offer of food is rich and this happens during special weeks within the vegetation period.

Now the problem : to reduce birdstrikes during the indicated periods in the mentionned areas. That could be reached only by observation of birds, by observation of the vegetational state and by warning pilots. For it is difficult to observe small distance migratory flights of birds in low altitudes we had to go the indirect way over observation of vegetational state and agricultural use in the surrounding of the airfields and elsewhere, that means biophenological observations as they are done in many countries since years.

Since June 1977 the German Military Geophysical Office established a corresponding Service which consists on 120 stations distributed over Germany. These stations observe weekly spe-

AD F616135

cial phenological phases as you can see it on Fig.1) : f.i.

01 = Beginning of pasture; consequence = flocks of starlings

02 = First mowing; consequence = flocks of starlings

04 = Ploughing; consequence = flocks of gulls,crows,hawks

05 = Seed of corn; consequence = flocks of crows

11 = Harvest of rye; consequence = flocks of starlings,pigeons, sparrows,crows

These observations are transmitted by telex to the German Military Geophysical Office and serve together with other informations as a basis for risk-forecasts. So it is possible to get an idea about vegetation phases which happen and influence migratory movements of birds. From the Civil side of German Weather Service we got such informations about a period of more than 20 years, but the observation stations of the Civil Weather Service are not identic with military airfields; nevertheless they complete the data.

How important these observations are show the following figures which will be examples:

Figure 2 shows the height growth of maize in july/august in various geographical altitudes - I = northern Germany, II = Highland district, III = south of Danube river - . In the northern und southern part of Germany the harvest of mayze can be expected within the following decade. In consequence of harvest flocks of crows and pigeons will arise and therefore corresponding informations can be given to the airfields situated in this area.

Figure 3 shows the growth height of grassland,corn and root vegetable. The data of corn (20 cm) give information that flocks of crows may visit the district for food; the data of grassland(length 40 cm) show that mowing can be expected within the next decade and the starling population will increase; the data of root vegetable show that harvest will happen not before the next 2 months and therefore flocks of pigeons can not be expected.

Figure 4 shows the beginning of corn-cultivation and the difference in the dates until to 1 month in the various parts of Germany. With beginning of cultivation the population

of crows and gulls will increase; therefore also in that case a corresponding warning is possible.

Figure 5 documents the harvest of corn in Germany and shows, dependent on the geographical altitude, differences between july 4th and august 8th. The beginning of harvest marks also the possible beginning of increasing pigeon-,crow- and small bird population.

So, on the basis of this knowledge it will be possible to forecast tendencies about increasing or decreasing bird populations in the surrounding of airfields but also about short- or medium-scale migratory movements of birds which could be important for low level flights.

Ort:.................... **Biophänologische Beobachtungen** Woche:

(Teil 1)

Lediglich ankreuzen, welche der nachstehenden Aussagen für die Beobachtungswoche zutraf:

00		Keine Änderung gegenüber Vorwoche	21		Kartoffeln, Aufgang
01		Weideauftrieb	22		Kartoffeln, Ernte
02		Heuschnitt (Mahd)	23		Futter-/Zuckerrüben, Aussaat
03		Weideabtrieb	24		Futterrüben, Ernte
04		Pflügen	25		Zuckerrüben, Ernte
05		Getreide, Aussaat	26		Futterpflanzen, Auflauf
06		Wintergerste, Bestocken	27		Futterpflanzen, Schnitt
07		Wintergerste, Gelbreife *)	28		Weißbirke, Laubentfaltung
08		Wintergerste, Ernte	29		Weißbirke, Laubverfärbung
09		Winterroggen, Bestocken	30		Weißbirke, Laubfall
10		Winterroggen, Gelbreife	31		Hainbuche, Laubentfaltung
11		Winterroggen, Ernte	32		Hainbuche, Laubverfärbung
12		Winterweizen, Bestocken	33		Hainbuche, Laubfall
13		Winterweizen, Gelbreife	34		Rotbuche, Laubentfaltung
14		Winterweizen, Ernte	35		Rotbuche, Laubverfärbung
15		Sommergetreide, Bestocken	36		Rotbuche, Laubfall
16		Sommergetreide, Gelbreife	37		Stieleiche, Laubentfaltung
17		Sommergetreide, Ernte	38		Stieleiche, Laubverfärbung
18		Futter-/Körnermais, Auflauf	39		Wildkirsche, Fruchtreife
19		Futtermais, Schnitt	40		Eberesche, Fruchtreife
20		Körnermais, Ernte			

*) Gelbreife = gelblicher Schimmer über Getreidefeld

(Teil 2)

Längen bzw. Höhen der Kulturen in cm angeben:

41		Wiesen/Weiden/Obergräser	46		Futtermais
42		Wintergerste	47		Körnermais
43		Winterroggen	48		Kartoffeln
44		Winterweizen	49		Futter-/Zuckerrüben
45		Sommergetreide			

Schlüsselzahlen (Teil 1) wöchentlich, Schlüsselzahlen und cm-Angaben (Teil 2) *) monatlich bis jeweils donnerstags 1300 Z an die GeophysBSt des Flugplatzes geben bzw. Karten auf dem Postweg monatlich an Amt für Wehrgeophysik - W II 4 Mont Royal, 5580 Traben-Trarbach leiten.

Datum: Unterschrift:

*) Beispiel für Teil 2: 42 (13) = Wintergerste Halmlänge 13 cm

211

Höhenwachstum (Mittelwerte) von Futtermais in den Monaten Juli und August 1977 in den einzelnen Höhenstufen

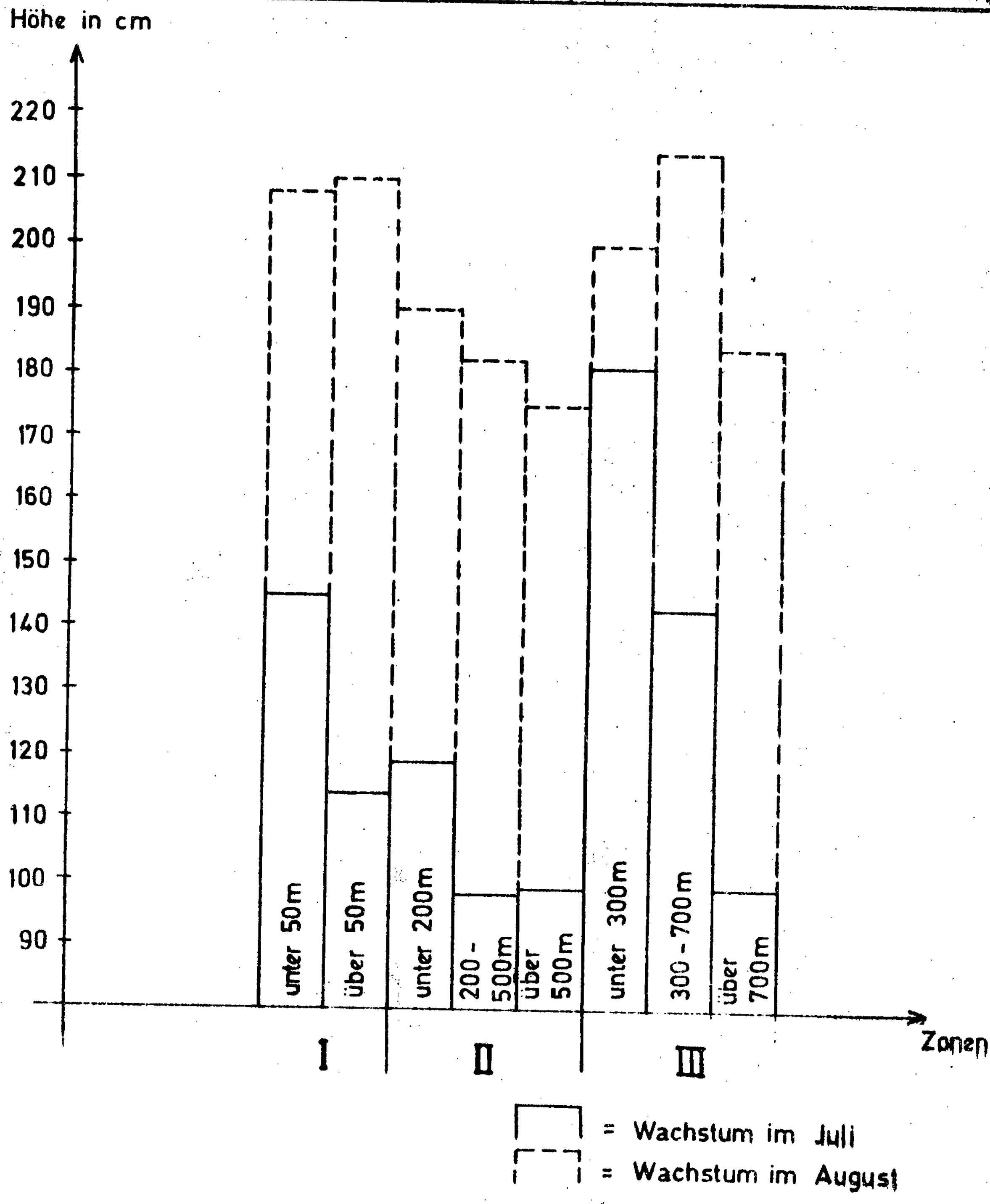


FIG. 3

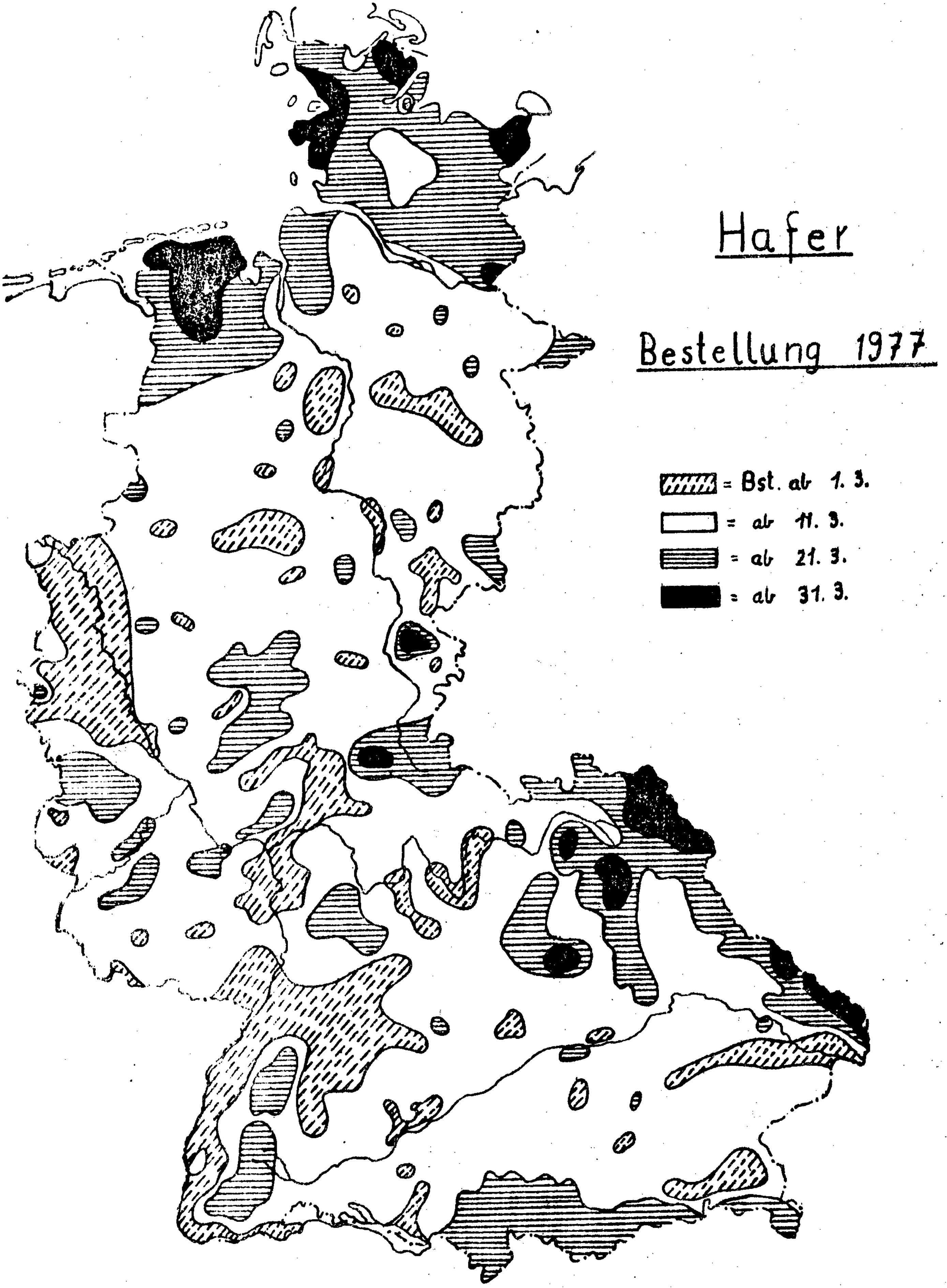
Geländedatenbank hier: Bewuchshöhen in cm

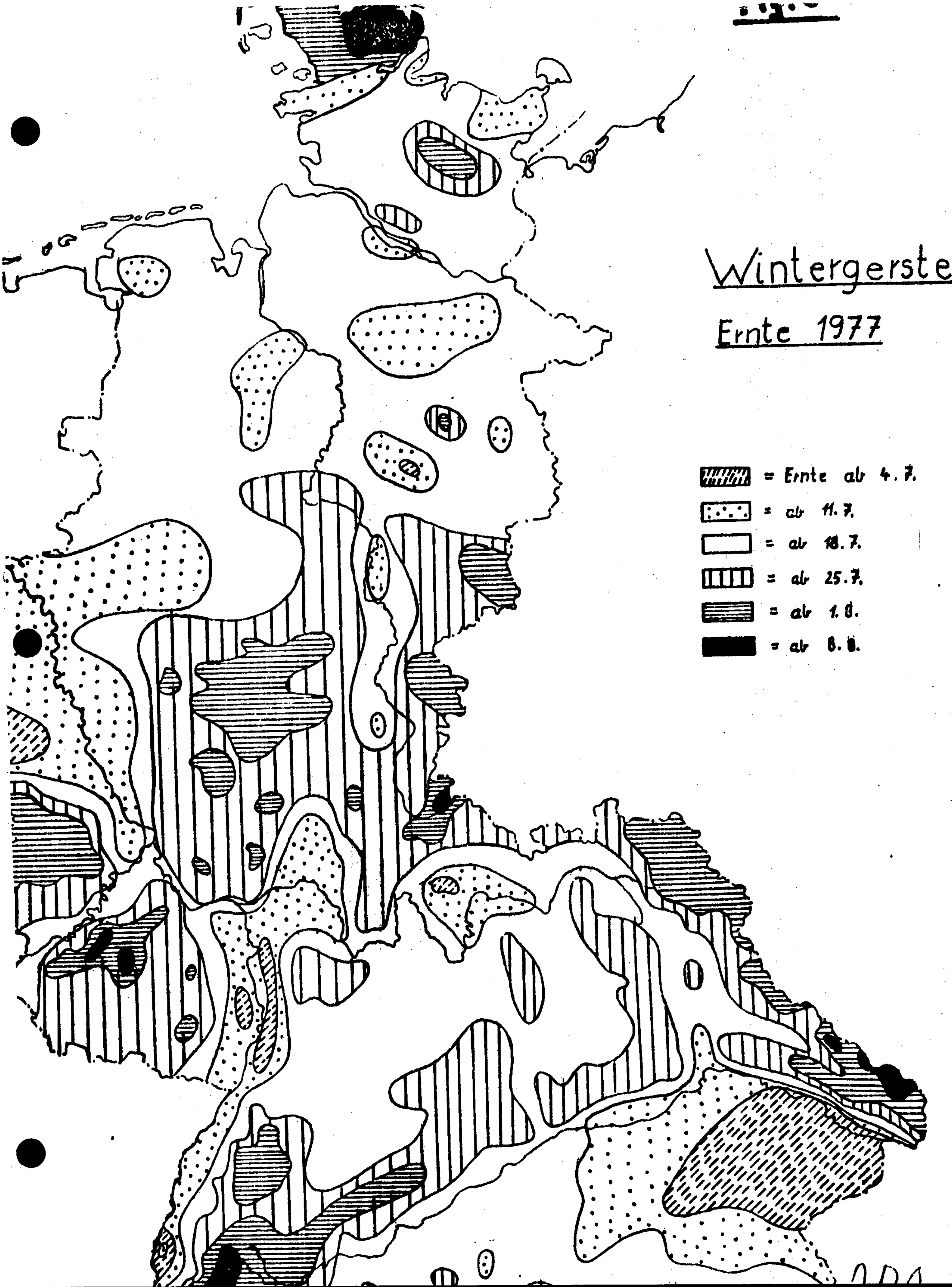
Gebiet: nördlich 52°24';

Höhenstufe 0-200m

Dekade	Grünland	Halmfrucht	Blattfrucht	Sonderkulturen
01.04. - 10.04.	20	20	5	0
11.04. - 20.04.	20	20	5	0
21.04. - 30.04.	20	20	10	0
01.05. - 10.05.	25	25	10	0
11.05. - 20.05.	30	30	10	20
21.05. - 31.05.	30	30	15	30
01.06. - 10.06.	35	50	20	50
11.06. - 20.06.	40	70	20	60
21.06. - 30.06.	40	90	30	80

Fig. 4




Wintergerste
Ernte 1977
= Ernte ab 4.7.
= ab 11.7.
= ab 18.7.
= ab 25.7.
= ab 1.8.
= ab 8.8.

Working Paper No 21
26 May 1978

Bird Strike Committee Europe - 13th Meeting in Berne, Switzerland from 29 May to 2 June 1978

Operational Control of Airspeed for Minimizing Bird Impact Hazard

Presented by: P F Richards CAA, UK.

1. In considering the operational control of airspeed for minimizing bird impact this Paper deals with the structural aspects only, although it will be clear that any measures taken in these respects will probably help to reduce engine damage.

2. For a number of years the British Civil Airworthiness Requirements have required that transport aircraft should be able to resist a 4 lb bird impact anywhere on the airframe structure at the highest forward airspeed likely to be achieved up to 8,000 ft altitude during normal operation.

3. The present US civil requirements are rather different in requiring protection of the windscreen against a 4 lb bird and the horizontal tail surfaces against an 8 lb bird but with nothing specified for the rest of the airframe structure. However, the latest US requirements about to be adopted will correct this omission for future aircraft. The 8 lb bird requirement has not in general been applied to current US aircraft.

4. Nevertheless, as a result of CAA investigation for UK certification most current foreign transport aircraft are believed to have a general 4 lb bird impact capability already.

5. The most sensitive regions high-lighted by these investigations have been :-

(a) windscreens

cont...

(b) the canopy region above the windscreen shielding the overhead control panel

(c) wing and tail leading edges, with the possible vulnerability of fuel tanks, systems, and flying controls, especially if any of these are situated ahead of the front spars.

(d) airspeed probes, which although duplicated may both be destroyed by being either too close together or by being simultaneously struck by disintegrating structure such as the radome.

In a few cases, mostly in the design stage, strengthening of structure, re-routing of systems or re-location of airspeed probes has been found necessary.

6. One may conclude, therefore, that most transport aircraft under the normal circumstances associated with the majority of operations are very unlikely to suffer any serious structural damage from bird impact.

7. However, there will be occasions when larger birds than 4 lb weight may be in the vicinity of aerodromes. Although it is believed that such birds are more predictable in their movement and that airport authorities should be able to give some prior warning to pilots as to their whereabouts - particularly under migratory conditions or where popular feeding ground locations can be identified - experience has shown that the possibility of collision cannot be ruled out.

8. Whilst the UK does not believe that there is an airworthiness case for requiring positive protection against the impact of birds greater than 4 lbs weight, it is anxious nevertheless to take any reasonable steps which can minimize such hazards.

9. Apart from the various punitive measures which airport authorities may be able to take in discouraging birds, a subject which this Committee is actively pursuing, there are positive

cont...

benefits from the operational control of airspeed when it is known that larger birds are in the vicinity of an airport, as indicated from the following considerations.

10. Extensive structural testing in the UK has shown that the force of bird impact is directly related to bird weight and $(\text{airspeed})^n$, where n lies between 2.7 and 3.0 (and not 2.0 as might be thought from theoretical considerations of the dissipation of energy). It is interesting to note that such a relationship was shown many years ago to be also true for ballistic missile penetration of armour. Thus,

$$\frac{V_2}{V_1} = \left(\frac{W_1}{W_2}\right)^{1/n}$$

where,

W_1 is the bird weight for which structural integrity has been previously established at normal airspeed V_1

and

W_2 is the larger bird weight under consideration and V_2 is the associated reduced airspeed required to maintain structural integrity.

This shows clearly that airspeed has a much more powerful influence on impact force than bird weight. Conversely, it will be evident that a modest decrease in airspeed can produce a disproportionate increase in bird impact resistance. In fact, assuming $W_1 = 4$ lbs, $W_2 = 8$ lbs and $n = 3.0$, then $V_2 \equiv 0.8\ V_1$.

11. A 20% reduction in airspeed during climb after take-off or initial approach to landing is believed to be within the capability of most aircraft, but perhaps requiring the more prolonged use of wing-flaps to avoid getting too close to stall or encountering controllability problems.

cont...

12. It is suggested that such an approach could be implemented in the flight crew operating manual, which could give advice on the airspeed reduction procedure which should be followed when, in the opinion of the airport authority and/or pilot, there is an undue risk of encountering birds during either climb after take-off or initial approach to landing.

13. Such an approach has yet to be discussed within the CAA, but the BSCE may wish to endorse such action.

Discussion on WP 21

: It might be dangerous to reduce the speed considerably when flying at the lowest levels. If something happens you are in a worse situation.

Richards: I have not heard before that a moderate reduction of speed can have such an effect.

: What do you think about the use of wing-flaps for speed reduction?

Richards: Use of wing flaps of modern aircraft is an exact method for speed determination and it does not involve any danger.

Pierre: Is it worth while to strengthen the structure of an air-craft in order to get a better safety?

Richards: I don't know but I suppose that a conderable strengthe-ning will become very costly.

Turesson here informed the audience about some details of a paper "Susceptibility of Aircraft to Bird Strike Damage" which was presented by V D Moorthi from the IATA office of Bangkok at the ICAO workshop on reducing bird hazards held in Bangkok last March. According to this paper an increase in weight of 1000 lb for all commercial aircraft belonging to airlines of ICAO states would cause an incresed cost of some 600 million US dollars in purchase price. The cost per year of extra fuel for all those aircraft would amount to about 35 million dollars.

BSCE 13 / WP 25

ADF616137

Preliminary Laboratory and Field Trials of the Chemical Repellent Synergised Ammonium Aluminium Sulphate on Rodents and principally Birds.

by Martyn Riley.
Froebel Institute, London, SW 15.

May 1978.

At every meeting of this Committee since its inception great emphasis has been placed by all delegates on the overwhelming importance of reducing bird strike by removing birds from airfieldsand their surrounding areas. Unwittingly much has been done in the past to encourage birds to these areas such as crop planting. Airfields and their associated buildings are in many respects a haven for many species of birds, large expanses of short herbage provide safe roosting and often areas between runways are sown with cereal crops which provide food for granivorous birds and the small rodents found within these areas provide food for birds of prey. Refuse tips are often situated near airfields and these attract scavenging birds such as Black-headed Gull (Larus ridibundus).(Stone '77) The hangars and other buildings provide roosts and nest sites for birds such as sparrows(Passer spp.). Many methods of control have been tested usually with little success- bio-acoustic scaring, gas cannons, and the use of trained birds of prey all have their limitations. However, at Ben Gurion International Airport, Israel, a degree of success was achieved with the chemical repellent Synergised Ammonium Aluminium Sulphate(referred hereafter as SAAS).(Dar 1977).

I have included research which is particularly relevant to these problems. Attacks by birds on commercially grown crops are comparable to the problem of birds feeding on airfields. The problem of birds in hangars is similar to that found in many farm outbuildings. I have carried out a number of trials on rodents and the results indicate that rodent populations can also be controlled.

.../2

Observations of bird movements on treated areas are encouraging-SAAS appears to have, to some degree, an effective repellent action. Quantitative results from most of the field trials are not currently available as much of the value of SAAS cannot be assessed until harvest.

A fruit farm near Rochester, Kent suffers, as do all fruit farms, from bird damage particularly sparrows (Passer domesticus) damaging the flower buds of gooseberry (Ribes) bushes.

As soon as damage was noticed this year on 10 April an area of 30m x 10m was sprayed with SAAS in solution with an emulsion adhesive. The gooseberry field, in all 0·5 hectares, is bordered on two sides by mature orchard, on one side by a dense hedge of Leyland Cypress and on the fourth by a damson (Prunus) hedge 5m high, behind which lies a footpath and an overgrown bank 2m high covered with nettles (Urtica), brambles (Rubus) and elders (Sambucus).

Most of the damage is confined to the corner bordered by the hedges and this was the area sprayed. It was decided to spray alternate rows as a light breeze carried the spray onto adjacent rows. In all 4 rows of 21 bushes each were sprayed effectively treating 8 rows.

The results of this trial can only properly be assessed by comparing the yield of the treated bushes with that of the untreated bushes. Reports of observations by the farmer and his staff however show that overall fewer birds were seen in the field than before the application and fewer birds were seen in the treated area than in the untreated area although the treated area was the one normally visited.

Observations by me 27 April, 17 days after the application showed that the repellent was stillv visible on the leaves. I observed the field for two hours and noted that birds still flew into the field from the hedgerows but flew over the treated area and settled in the untreated area.

At the same farm an area 100m x 28m surrounded on $3\frac{1}{2}$ sides by mature orchard andt the remainder by farm outbuildings was sown with Beetroot (Beta). On 11 April the farmer noticed that sparrows were damaging the emerging plants. The area was then sprayed with SAAS once around the perimeter and in two bands across the field. The width of the spray was 2m. After spraying damage ceased. Unfortunately no control was left to assess any repellent action. However, the sparrows were still present in the area and I feel that it can safely be assumed that there was a degree of repellency.

....

An open fronted concrete and asbestos store shed (approx 8m x 15m x 6m high) at this same farm in Kent, is used throughout the year by House Sparrows and up to IO Starlings (Sturnus vulgaris), as a roost. In the spring and summer sparrows regularly nest under the corrugations in the eaves and over the joists. The shed is used to store apple boxes throughout the year and the bird droppings constitute a health hazard.

On IO april this year one quarter of the roof was sprayed with SAAS and the remainder left as a control. The farmer regularly observed the shed particularly at dawn and dusk and for 5 days no birds were seen in the treated area of the roof and fewer birds were seen overall. Gradually up to 5 birds roosted in the treated area whereas up to 25 had previously been seen. On 9 May the sprayed area still contained fewer birds approx 5 than the untreated area where 25-30 birds were regularly seen. A nest with eggs which had been sprayed had been deserted.

A new method of treatment is now beibg tested in this building as much of the spray runs off the non-absorbent concrete and asbestos. Strips of foam soaked in the solution are tied to the joists to keep the repellent in the area to be treated. Results are not yet available.

A farmer in Nottinghamshire suffers a minimum of 20% loss on his radish (Raphanus) crops sown in succession throughout the summer months, usually 4-5 separate sowings.The plants are damaged at emergence by up to IOO greenfinches (Carduelis chloris) and house sparrows and also by chaffinches (Fringilla coelebs), linnets (Acanthis cannabina) and skylarks (Alauda arvensis). This damage has continued for 15 years.

A survey of the extent of crop damage when protected by various bird-scaring devices is beibg undertaken by the Pest Infestation Office, Ministry of Agriculture, Fisheries and Food, Nottingham. A gas cannon and a gas-operated scarer which throws a brightly painted metal flag 10 metres up an aluminium pole have been tried with little success. In fact with these devices used together they were found to be effective up to IO metres, beyond this range the birds were simply disturbed and settled a few metres away. Red and white tapes held off the ground so that they flicker in the wind and black cotton are al also being evaluated.(Jones pers comm.)

A strip of ground 100m x 5m was sown with radish seed treated with SAAS seed dressing powder on April. Random plots were were covered by bird proof cloches as controls. No data will be available to assess the effect of SAAS until harvest but observations by a staff member of the Ministry of Agriculture state that for the first three days no birds were seen on the plot and the numbers of birds present after that date were 'significantly less than expected' (Jones pers comm.)

A mouse when confronted with new stimuli such as when it is placed in a different cage will advance within the boundaries of its senses-sight, hearing, touch, taste and smell- if the stimuli are judged safe it will advance. The normal reaction of a mouse to SAAS in dry powder form are as follows (defined by observation of 30 individuals). When confronted with SAAS, which is thought to act on the senses of taste and smell, (Stone77) [illegible] and sniffs vigourously, it will often sneeze, the eyes may run and the animal shows signs of fear and or agitation - higher metabolic rate, defaecation, and rapid movements. On retreating from the direct area of SAAS a series of bouts of grooming takes place particularly around the head. Certain mice have been observed to suffer discomfort - turning around sharply a number of times to groom the rear and showing signs of agitation- if particles of the dust adhere to the skin during and after urination.

A number of mice were kept without food for 5 hours and then offered a food pellet treated with SAAS. The initial reaction of all the mice showed the same general pattern. They all showed caution which ranged from a few tentative sniff and retreating to walking around the food dish a number of times. The mouse would pick up the pellet in its teeth and nibble at one end. No immediate feeding would take place but a series of cautious 'tastes' took place which lasted x from 2 mins to $4\frac{1}{2}$ mins before any determined feeding took place. All the mice removed the outside of the pellet and ate the inside core. In all cases the discarded outer layer was not consumed even though the mice had had well below their normal food intake. (Determined by experiment to be 0.2099 gms per hour over 24 hours).

Ten mice, kept without food for 5 hours, were offered one treated and one untreated pellet. In all cases the untreated pellet was favoured, removed from the dish and eaten. Six of the mice then removed the outer layer of the pellet and ate the core. No individual ate the outside of the treated pellet and they all eagerly consumed an untreated pellet at the conclusion of the experiment 2 hours later.

The repellent SAAS has been used in many countries throughout the world to attack many vertebrate pests(Stone I977). Very few have been correctly monitored by scientific bodies and the trials described in this paper represent the start of a series of experiments to be carried out to provide accurate data to assess the efficiency of the repellent Synergised Ammonium Aluminium Sulphate.

Acknowledgements.

I thank the staff of the Froebel Institute and Digby Stuart College, Roehampton Institute of Higher Education for allowing me to use their facilities. Dr. Adrian Bonner, Dr.Audrey Harvey and Peter Shaw M.Tech. for their tutorial help and encouragement. Maurice Wright Of Perry Hill Farm, Cliffe,Kent and P.Hammond of Spring Farm, Nottingham for allowing me to carry out field trials on their farms.Sphere Laboratories(London) Ltd., for providing SAAS at no charge.

References.

Dar. G., 1977. Treatment for Repelling birds at Ben Gurion (LOD) International Airport, Israel. BSCE 1977.

Jones B. 1978 Personal Communication Ministry of Agriculture Fisheries and Food. Nottingham.

Stone R. 1977. Development of the theoretical construct of Synergised Ammonium Aluminium Sulphate for the control of Birds at Airports.

BIRD STRIKE COMMITTEE EUROPE BERNE

29 MAI AU 02 JUIN 1978

ETUDE DE LA RESISTANCE DES STRUCTURES AUX IMPACTS D'OISEAUX

PAR :

B. DELOR : Centre d'Essais Aéronautique de Toulouse

J. BESSE : Société Avions Marcel Dassault-Bréguet Aviation

283

1 - INTRODUCTION

Le Centre d'Essais Aéronautique de Toulouse dont la mission consiste en l'expérimentation au sol de matériels aéronautiques, en vue de leur mise au point, ou de leur homologation ou certification par les Services Techniques officiels, dispose d'une installation permettant de soumettre les structures d'avions aux impacts d'oiseaux.

Cet exposé traitera dans sa première partie des caractéristiques de l'installation.

Dans une deuxième partie il sera décrit les différents types d'essais effectués sur cette installation.

Signalons par ailleurs que ce sujet a fait l'objet de deux papiers nettement plus détaillés et présentés au cours de ce même congrès, lors de la réunion du groupe de travail : "Structural Testing of Airframes".

2 - PRESENTATION DE L'INSTALLATION

L'installation permettant de soumettre les structures d'avion aux impacts d'oiseaux se compose de deux canons à air comprimé dimensionnés pour effectuer des essais avec oiseaux de 1 à 8 livres.

Les caractéristiques principales de ces deux canons sont données dans le tableau ci-dessous :

	Canon Ø 150 mm	Canon Ø 300 mm
Longueur	12 m	12 m
Capacité du réservoir	1 m^3	3 m^3
Pression maximale de l'air comprimé disponible	30 bars	30 bars
Type de vanne utilisé	vanne à ouverture rapide	Opercule
Masse maximale du projectile	4 livres	8 livres
Vitesse maximale	300 m/s	500 m/s
Masse de l'emballage	0,15 kg	1 kg

Des photographies représentant ces deux canons sont données planche 1.

.../...

Le projectile est constitué d'un oiseau et d'un emballage en polystyrène expansé, moulé sur place.

L'emballage est partiellement détruit avant l'impact grâce à un dispositif placé à la sortie du canon et permettant de séparer l'emballage du projectile. La vitesse, paramètre essentiel de l'essai, est mesurée à la sortie du canon par un double système de cellules photoélectriques.

Tous les impacts peuvent en outre être cinématographiés avec une caméra à prise de vue rapide (3 000 à 5 000 i/s en couleur).

Pour certains essais des mesures d'effort à l'impact (par utilisation d'une balance à choc) et de contraintes (par jauges) sont effectuées pendant la durée de l'impact. Le nombre de paramètres mesurés est variable suivant la bande passante désirée, mais on peut ainsi obtenir 10 paramètres pour une bande passante de 10 kHz.

3 - DESCRIPTION DES DIFFERENTS ESSAIS EFFECTUES SUR CETTE INSTALLATION

Les essais effectués avec cette installation sont de trois sortes :

a) essais en vue de la certification de l'avion suivant les normes en vigueur.

b) essais à caractères d'études générales

c) essais divers

a) Essais de certification : ces essais sont effectués dans des conditions propres à démontrer la conformité de la structure aux spécifications des normes.

Ces essais, réalisés en général pour une vitesse du projectile correspondant à la vitesse de calcul Vc au niveau de la mer de l'avion, (norme FAR 25) sont de différents types :

- essais de chocs à l'oiseau de quatre livres sur la pointe avant, les parties concernées étant : la verrière, la casquette, le radome ...

- impacts à l'oiseau de 4 livres sur bord d'attaque de voilure.

- impacts à l'oiseau de 8 livres sur les empennages horizontaux et verticaux.

- impacts à l'oiseau de 4 livres dans les manches à air.

Les différents avions ayant subi des essais au C.E.A.T. sont : le Falcon 10, le Mystère 20, le Corevtte, le Mercure, l'Airbus A 300 B, le Concorde, l'Aviocar C 212, le Mirage F1, le Mirage IV A et le Jaguar.

.../...

2

b) Essais à caractère d'études générales : ces essais effectués sur des maquettes ou des parties simplifiées de l'avion permettent une approche des paramètres essentiels qui conditionnent la tenue de la structure à l'impact. Ces études ont débuté par les glaces en 1968, seules parties couvertes à l'origine par la règlementation.

- étude de la tenue des glaces : cette étude qui a déjà fait l'objet de huit campagnes d'essais entre 1968 et 1974 et de plus de deux cents tirs a pour but de donner une estimation de la résistance de glaces de compositions diverses aux impacts d'oiseaux en fonction de divers paramètres :

- masse et vitesse de l'oiseau.
- composition et forme de la glace.
- angle de la glace avec la trajectoire de l'avion.

Pour tous ces essais l'installation mise en oeuvre est le canon à air comprimé Ø 150 mm, ce qui limite la masse des projectiles à 1,8 kg.

Les glaces utilisées lors de cette étude sont rectangulaires (820 x 520 mm^2) ; la surface de visibilité est de 0,334 m^2 ce qui correspond aux dimensions du cadre utilisé pour leur fixation (750 x 450 mm^2). Une photographie du bâti d'essai est donnée planche 2.

L'exploitation de l'ensemble de ces résultats d'essais a permis d'établir des formules empiriques reliant les principaux paramètres entre eux.

- Pour des glaces de type monolithique on trouve ainsi des formules du type :

$$V^2 M^a \sin\alpha \, \lambda = K e^b$$

V : vitesse exprimée en m/s

M : masse du projectile en kg

α : angle d'incidence en degrés

e : épaisseur de la glace en mm

λ : coefficient de forme de la glace traduisant l'influence de la forme de la glace, de la structure environnante et de la méthode de fixation utilisée (pour les essais au C.E.A.T. : $\lambda \simeq 1$).

.../...

Les coefficients K, a, b dépendent du matériau utilisé :

	K	a	b
Plexiglass ordinaire	0,075	4/3	4
Plexiglass étiré	0,075	2/3	4
Polycarbonate	240	2/3	1,74
Verre	107 à 300 (suivant le degré de trempe)	2/3	1,5

- Pour les glaces de type feuilleté on trouve des formules du même type.

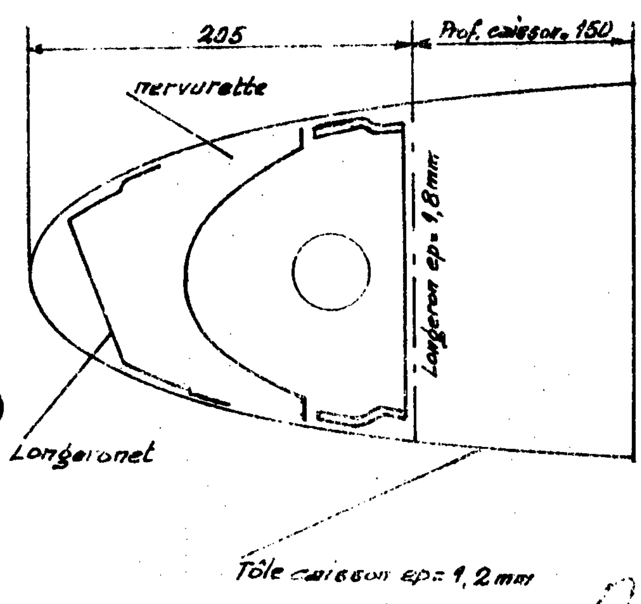
Toutes ces relations permettent d'obtenir un bon dimensionnement de la glace avant essais sur la structure complète (influence des conditions aux limites) et d'ajuster, après les résultats obtenus lors d'un premier essai, ce dimensionnement.

- <u>étude de résistance des structures</u> : avec la généralisation des essais effectués sur les autres parties de l'avion, d'autres études ont été engagées, et en particulier sur les bords d'attaque.

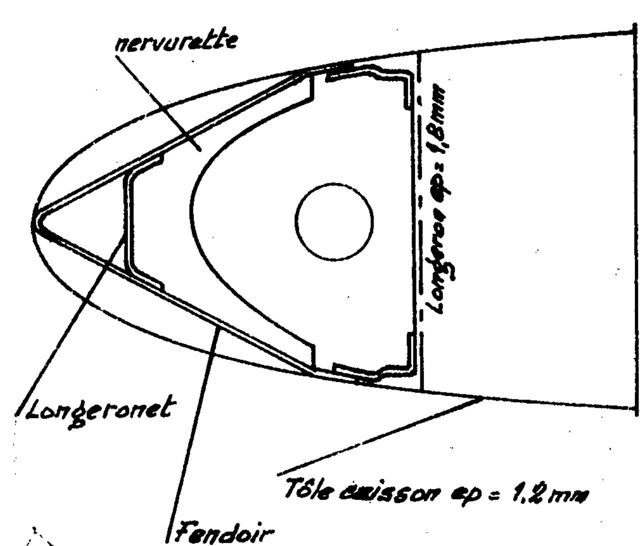
Cette étude qui a déjà fait l'objet de trois campagnes d'essais et de plus de soixante tirs a pour but d'étudier les différents paramètres susceptibles d'avoir une influence sur la vitesse critique de pénétration. Deux types de maquettes schématiques déduites du bord d'attaque d'un avion existant ont été essayées :

- bord d'attaque " type cylindrique "
- bord d'attaque " type fendoir "

BORD D'ATTAQUE TYPE "CYLINDRIQUE"



BORD D'ATTAQUE TYPE "FENDOIR"



L'installation mise en oeuvre est le canon ϕ 150 mm.

Le projectile est toujours constitué d'un poulet de 1,8 kg et d'un emballage de 150 g environ, partiellement détruit avant l'impact.

- Pour le bord d'attaque " type cylindrique " les paramètres variables sont :

- le rayon r du bord d'attaque (entre 20 et 200 mm)
- l'épaisseur e du revêtement (entre 1,6 et 3 mm)
- la flèche φ du bord d'attaque (entre 22°30 et 55°)
- l'incidence du tir α du tir (entre 0° et 10°)

Les résultats obtenus ont ainsi permis d'aboutir pour un bord d'attaque de construction classique par rivets, à la formule empirique suivant :

$$V_p = 56{,}7 \quad e \quad M^{-1/3} \cos \varphi^{-2/3} \exp \frac{850}{r^2 + 30\ r + 1000}$$

Vp : vitesse de pénétration en M/S

M : masse de l'oiseau en kg (influence non vérifiée au C.E.A.T.)

Cette formule diffère très peu de celle proposée par le R.A.E. (Technical Report 72056)

$$V_p = 98 \quad e \quad M^{-1/3} \cos \varphi^{-2/3} \exp \frac{1234}{r^2 + 30\ r + 1000}$$

[illegible] Vp [illegible] différences peuvent très certainement être expli- [illegible] es de struct[illegible]es des éprouvettes utilisées.

On constate que ces formules sont très comparables à celles trouvées pour les essais de tenue de glaces si l'on prend soin de remplacer l'angle de tir α par l'angle de la normale à la glace avec la trajectoire ($\varphi = \pi/2 - \alpha$).

Ces essais montrent enfin que ce type de bord d'attaque ne résiste pas aux vitesses élevées (V $>$ 150 m/s), dès que le rayon de bord d'attaque devient supérieur à 20 mm, avec une épaisseur de revêtement réaliste.

- D'où la définition du bord d'attaque "type fendoir". Pour les essais sur ce type de bord d'attaque les paramètres variables ont été :

- le rayon du fendoir (entre 2,5 et 15 mm)
- l'épaisseur du longeronnet (0,8 et 1,6 mm).

.../...

Les résultats obtenus lors de ces essais permettent de conclure en disant que la contribution du fendoir se traduit par une nette amélioration de la tenue d'ensemble. En outre le bilan est favorable en raison même de la masse ; à titre indicatif un bord d'attaque dont le revêtement à 3 mm d'épaisseur, de masse 9 kg, est déchiré à 10 m/s, alors qu'un bord d'attaque équipé d'un fendoir de 1,6 mm d'épaisseur dont le revêtement fait 0,8 mm d'épaisseur à une masse de 7,5 kg et n'est pas déchiré à la même vitesse.

- études en cours de développement : l'étude qui prolonge celle des bords d'attaque aura pour but de compléter les résultats sur structures à grand rayon de courbure sous faible incidence, du type casquette et de mettre en évidence les déviations éventuelles de la trajectoire après perforation (phénomène constaté au cours d'un essai sur radome Mercure) en faisant des essais systématiques sur plaques planes inclinées d'épaiseur variable.

Une autre étude visera à étudier par ailleurs le comportement à l'impact de matériaux amortisseurs du type NIDA, utilisé dans de nombreux cas pour des renforts locaux.

c) Essais divers : divers essais sont par ailleurs réalisés sur les installations et en particulier sur le canon Ø 150 mm. On peut ainsi noter :

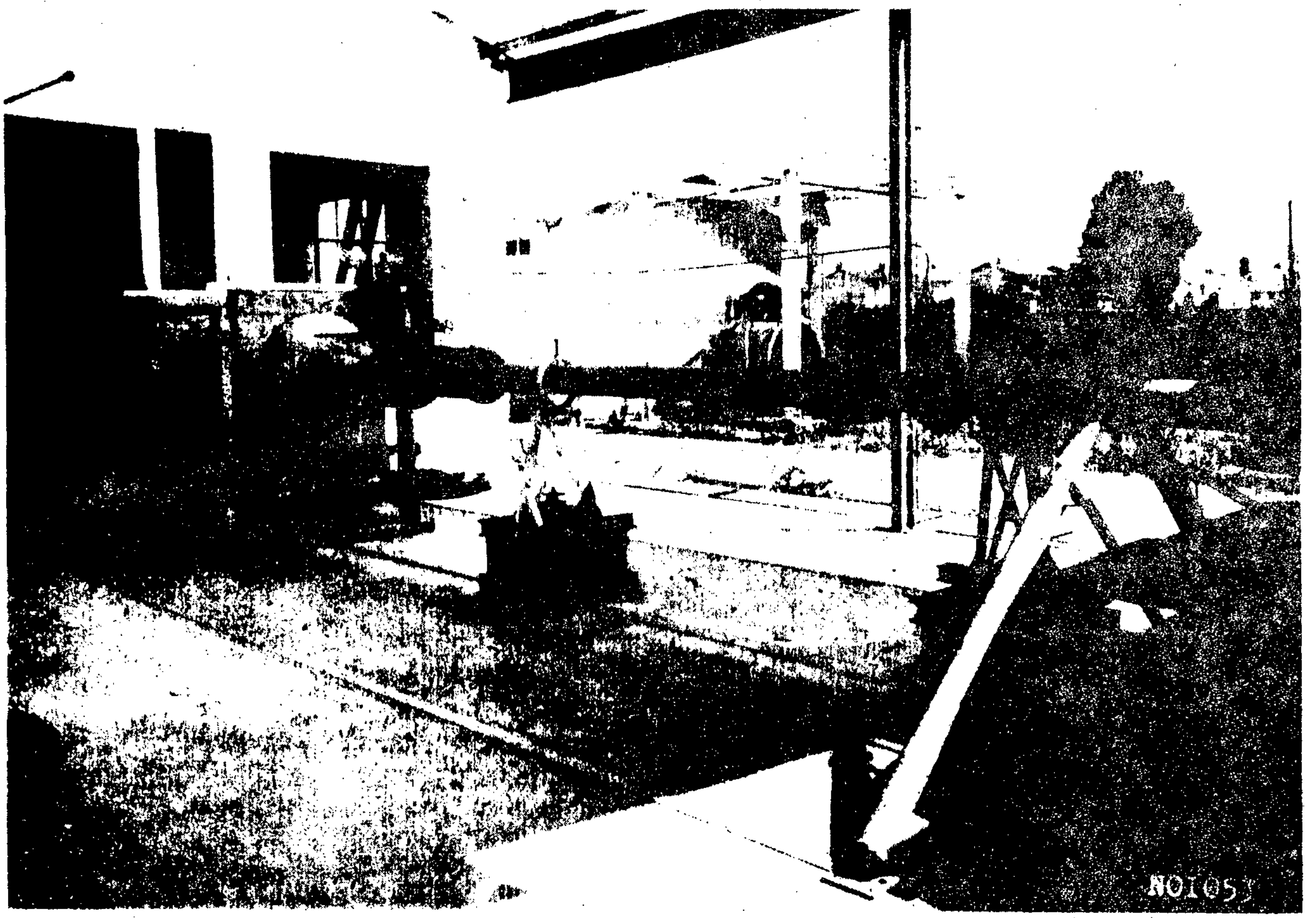
- des essais d'impacts de bouteilles et de cubes d'acier sur glaces de locomotives S.N.C.F.

- des essais de projection de parachutes extracteurs de sièges éjectables.

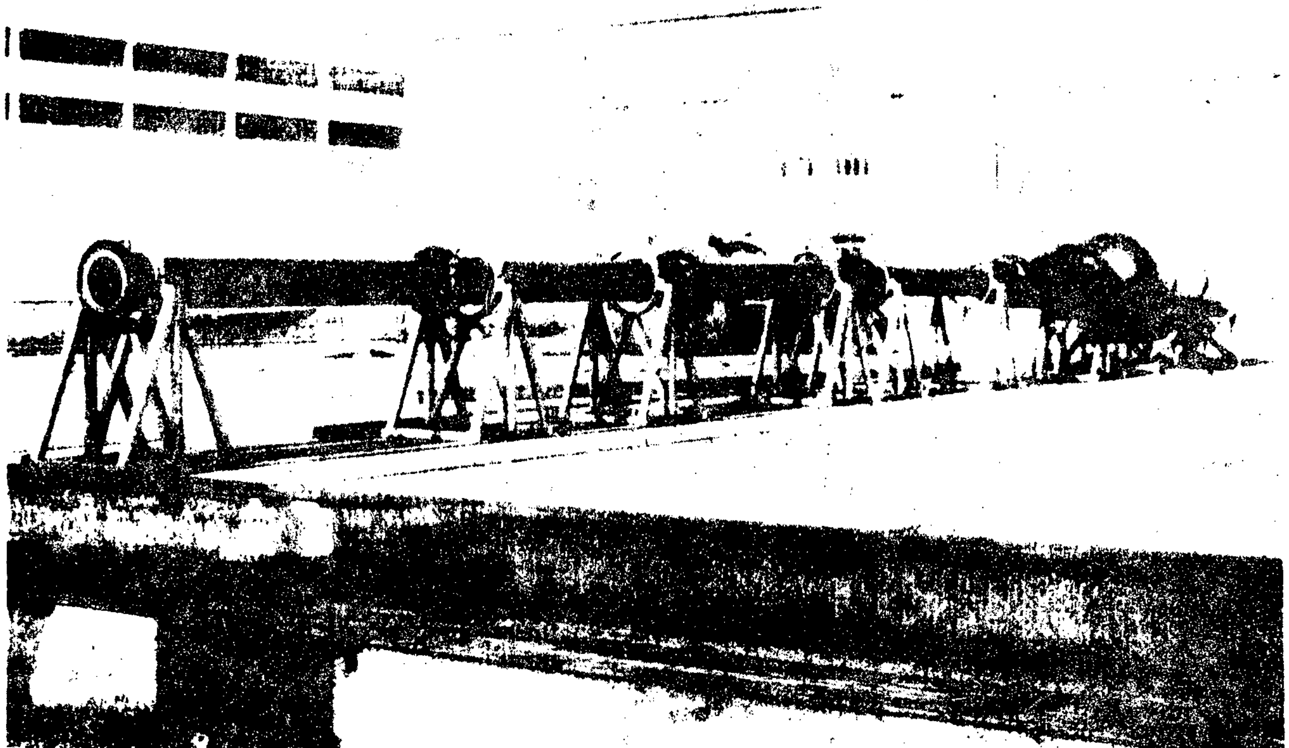
- des essais d'impact de grêlons sur différentes structures (phares, becs de bord d'attaque, matériaux sandwich ...).

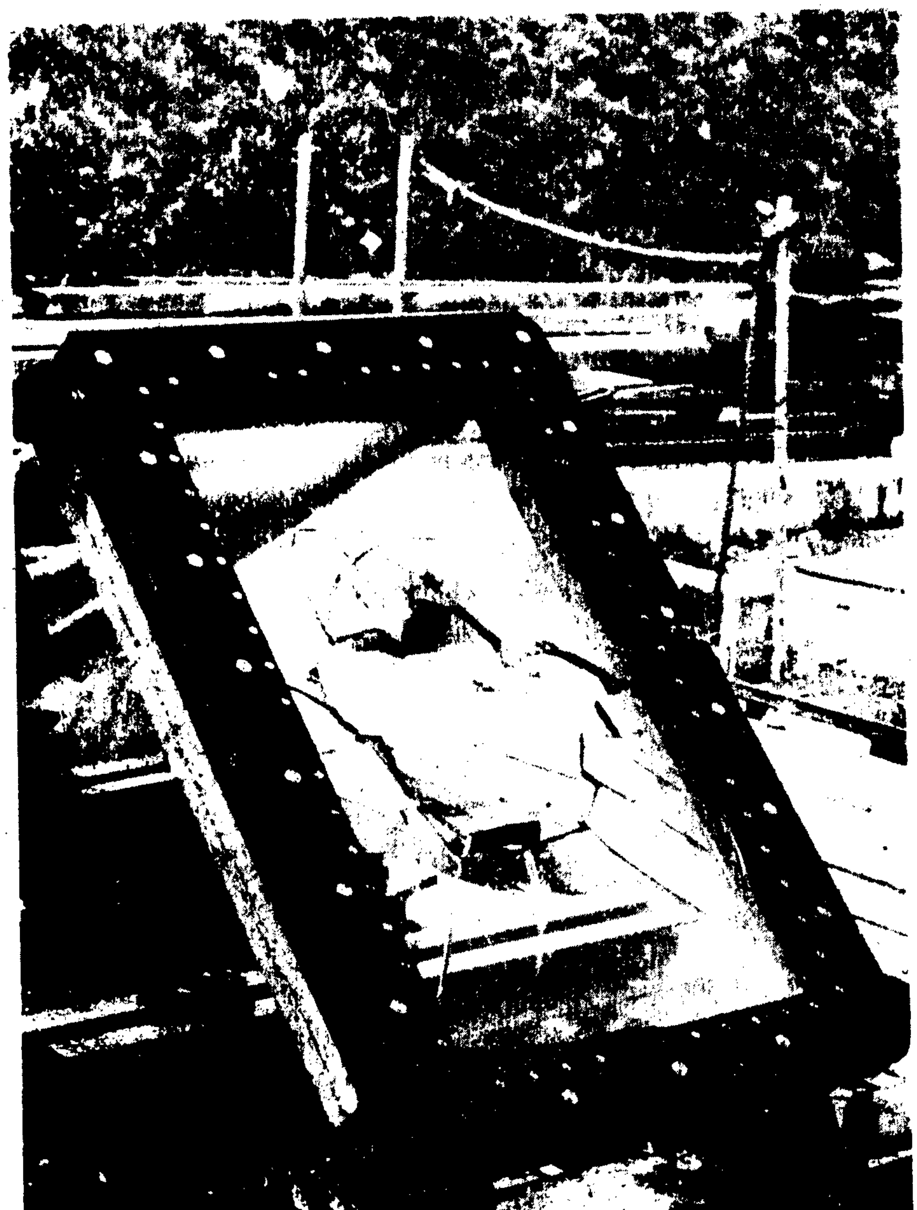
- des essais d'impacts de morceaux d'aubes de réacteurs sur des plaques de blindage.

- des essais d'impact de projectiles divers sur verrières (capteurs de pression, éléments d'électronique, ...).



Installation d'essai du canon Ø 150 mm





Montage d'essai utilisé pour l'étude de tenue des glaces

12th of May 1978 - KP/eg
BSCE 13 / WP 27

MEASURES AVAILABLE TO THE AIRPORT MANAGEMENT FOR THE REDUCTION OF THE BIRD STRIKE RISK.

1. INTRODUCTION.

There is sufficient statistical evidence that bird strikes impose significant repair cost upon airlines and that bird strikes may cause severe damage even to large transport aircraft.

The intention of this document is to collect and publish information about methods available for the reduction of bird strike risks on and around airports.

To what extent a specific measure will prove successful at a given airport depends on the local conditions and this paper does consequently not recommend specific measures, but concentrates on giving information about the different measures.

The paper is limited to measures which may be taken on and around airports. It does not deal with such items as radar-observations, forecasting of migration, problems relating to aircraft structures etc.

This paper may be used as a source of information, and it may be used as a comprehensive list of the different measures available.

The different measures available may be grouped together as set out below:

- Measures aiming at creating an environment hostile to the birds at or around the airport.
- Measures based upon the active scaring away of birds.
- Measures based upon the reduction of the number of birds.

2. INVESTIGATION OF THE BIRD POPULATION ON AND AROUND THE AIRPORT.

Before the application of different measures can be decided upon it is necessary to have sufficient knowledge of the different bird species staying on and around the airport.

Such information may be obtained through reports from airlines about bird strikes and through the collection of dead birds from the runway areas.

Further information may have to be obtained through observations and countings in the field.

ADP616135

3. MEASURES AIMING AT CREATING AN ENVIRONMENT HOSTILE TO THE BIRDS AT OR AROUND AIRPORTS.

3.1 Use of chemicals to make the soil of the airport unattractive to birds.

As such chemicals may affect the water supply and sewage systems, the chemicals considered should be carefully studied before applied.

Such chemicals may be used in order to make the soil unattractive to the birds. This type of chemicals are only used at very few airports and the success seems to be very limited.

Chemicals may also be used to kill plants or insects which serve as food for the birds. This application of chemicals is found at a number of airports, and the method seems to be successful provided the necessary considerations are given to the local conditions.

3.2 Control of trees and bushes at or around airports.

There is sufficient evidence that certain kinds of trees and bushes are attracting birds. If situated near the runways such trees and bushes may increase the bird strike risks.

Trees and bushes at the airport may be removed by decision of the Airport Authority. It should, however, be born in mind that areas with trees in certain cases serve as noise- and smell protection for dwellings near the airport. With the increase of the public pressure against noise and smell from airports it is likely that a number of airports will establish wood-areas in order to protect critical dwelling zones. It is recommended that due consideration is given to the bird strike problem, when such protective wood-areas are considered.

While trees and bushes at the airport may be controlled by the airport authority, the situation is different for areas outside the airport boundary. The aviation authorities are in most cases only able to have trees and bushes removed which penetrate the obstacle limit surfaces. When obstacle restriction considerations are not applicable, the only possibility seems in most cases to be a voluntary agreement with the owner of the land in question.

3.3 Control of the length of the grass along the runways.

The general opinion is that a grass length of 15-20 cm will in most cases prevent birds from staying in the area. The optimum grass length should, however, be decided with due consideration to the local environment.

In areas close to runways and taxiways it may not be possible to accept the recommended grass length. The reasons why the grass in these areas have to be kept very short, are danger of fire and in order to avoid that lights and signs are covered by grass.

3.4 Control of agricultural activities.

Agricultural activities, especially such as plowing and harvesting, may attract large flocks of birds, which are highly undesirable in the vicinity of airports.

Agricultural activities at the airport may be controlled by the Airport Authority and today a large number of airports have stopped their agricultural activities in order to reduce the bird strike risk. Outside the airport area the Airport Authority has in most cases little or no possibility for controlling agricultural activities. The two possibilities left open will in most cases be either to buy the land or to reach an agreement of the land owners, which may require substantial monetary compensations.

3.5 Possibilities for control of different activities outside the airport boundary.

A number of activities in the areas around airports may increase the number of birds and the bird strike risk. Among the more important activities may be mentioned:

Garbage dumps.
Sanctuaries.
Racing of Homing Pigeons.

The possibility of influencing garbage dumbs and sanctuaries is a matter of national legislation. In some countries the "Aeronautics Act" provides for the enforced removal of such facilities, but in most cases the only possibility is negotiations with the authorities involved.

Racing of homing pigeons near airports may in some countries be controlled through provisions in the "Aeronautics Act", but in most cases the only possibility left open is negotiations with the local "Homing Pigeons' association", which may have some influence on its members. One recommendation which such an association may pass on to their members, is to keep the pigeons away from the airport by suitable feeding. It has been indicated by biologists that there is a possibility to feed pigeons in such a way that they do not need to forage in the open to be able to cover the need for the different nutrience.

4. MEASURES BASED UPON THE ACTIVE SCARING AWAY OF BIRDS.

The measures classified in this group are such as Acoustical scaring devices, Pyrotechnique scaring equipment and shooting of birds at the airport.

4.1 Acoustical scaring.

These devices are in most cases mounted on vehicles, but they may be fixed installations. The most common system will via a tape recorder and a loud speaker system transmit distress calls from relevant bird spices. The method has proved effective at several airports when used

together with other measures. The method may be based upon the transmission of ultrasonic sound, which is a technique being investigated at some airports. The efficiency of this method has not yet been proved.

4.2 Pyrotechnical Scaring Equipment.

A typical equipment is the shell cracker which is designed to project a small bomb which explodes at the end of the trajectory. The explosion may be combined with the development of smoke. When shell crackers are used, care should be taken to avoid any danger of fire. Other possibilities are Verey pistols, shot guns and flashing lights. Generally speaking these methods seem to be useful especially when combined with acoustical scaring.

Falconry has been used with some success at a limited number of airports. The method is difficult to apply, because the falcon species applicable are rare and protected and because falconry requires specially trained people.

The disposal of dead birds or models of dead birds have been used at some airports. In the case of dead birds the method only seems to be effective as long as the corpses are fresh.

A limited shooting of birds seems to be a successful method when applied together with other methods. A number of bird species are protected during parts of the year or throughout the year. It is considered important that airports obtain the approval from the appropriate authorities to shoot also such birds when they are considered dangerous to aviation.

5. MEASURES BASED UPON THE REDUCTION OF THE NUMBER OF BIRDS.

To achieve a significant reduction of the bird strike risk through a reduction of the number of birds, is in most cases, considering the difficulties involved, not possible.

There are, however, a few important exceptions from this general rule. When a large number of birds are breeding in a limited area, it may be possible to destroy the eggs and by this reduce the size of the next generation.

ESSAIS en cours du Répulsif RETA

M.LATY, France

Introduction.

Au cours des dernières réunions du Bird Strike Committee Europe, différentes communications ont fait état de la possibilité qu'il pourrait y avoir à utiliser avec succès The chemical Repellent Synergised Aluminim Ammonium Sulfate ou S.A.A.S (1,2) connu aussi sous le nom de RETA (3,4) pour tenir les oiseaux à l'écart des zones actives d'un aérodrome.

A la suite de ces communications, l'essai de ce produit a été entrepris en France par le Service Technique de la Navigation Aérienne sur l'Aérodrome Principal de Marseille-Marignane.

Objectif expérimental.

Un nombre important de collisions se produisent dans le volume des aérodromes avec des oiseaux d'espèces différentes préalablement stationnés, au repos ou se nourrissant sur ou à proximité des pistes.

Dans ces conditions comportementales, les modalités d'action d'un répulsif chimique peuvent différer suivant que le produit a été épandu sur un substrat nu (sol découvert, béton, surface métallique ou plastique etc....) ou sur la couverture végétale existante.

Aussi,les essais du RETA ont-ils porté dans un premier stade sur la recherche d'un effet répulsif vis à vis d'oiseaux qui ont l'habitude de se poser sur les parties dénudées des aérodromes.

Sur l'Aérodrome de Marseille-Marignane, le site expérimental choisi présente un substrat semblable à celui des pistes et voies de circulation.

Site expérimental

La digue construite sur l'étang bordant l'aérodrome a servi de support expérimental.

Régulièrement fréquentée par les oiseaux marins, elle sert de perchoir aux Goélands argentés (larus argentatus) et aux Erands cormorans (Phalacrocorax carbo). Isolée du rivage, son accès en bateau est interdit aux personnes étrangères à l'aéroport.

Ainsi, durant toute la période des essais, les oiseaux sont restés à l'abri de tout dérangement humain non souhaité par l'expérimentateur.

Cette digue est composée d'un ensemble de blocs parallèlipipédiques en béton, jointifs, dont la suite constitue une surface plane horizontale de 1,50 m de large sur 300 m de long à 2,50 m du niveau de l'étang.

En période de forte fréquentation, les oiseaux occupent l'ensemble du perchoir sans que ce dernier soit saturé. Toutefois, les Goélands et les Cormorans se posent alors avec une préférence notable pour une portion de la digue marquée ainsi par une plus grande densité d'oiseaux.

C'est aussi à cet endroit que se trouvent les quelques dizaines d'oiseaux présents en période de moindre fréquentation.

C'est précisément cette portion de la digue qui a été choisie comme zone de traitement, le reste de l'édifice constituant les zones témoins, c'est à dire des aires perchoirs de remplacement pour les oiseaux qui abandonneraient la zone de traitement.

La superficie de la zone de traitement est de 90 m2 et l'ensemble des deux zones témoins situées de part et d'autre couvre 400 m2.

Les zones témoins et la zone de traitement ont été délimitées par des indications numérotées sur une des paroies verticales. Ainsi la suite de l'expérience a été suivie à partir du rivage sans dérangement pour les oiseaux.

Processus expérimental.

Le Reta a été appliqué par pulvérisation d'une solution aqueuse au moyen d'un pulvérisateur à dos à pression préalable. Le bouchon et le disque de jet de la lance d'aspersion ont été modifiés de façon à obtenir un jet plus dru et une plus grande rapidité d'épandage malgré le vent. Ainsi la surface de béton de la zone de traitement a été abondamment mouillée de solution.

Dans un premier temps, il a été vérifié que le dérangement par la seule présence de l'expérimentateur procédant à l'épandange sur la zone de traitement ne constituait pas par lui même un facteur répulsif suffisant pour entrainer l'abandon du site par les oiseaux. Pour cela, à deux jours d'intervale, il a été pulvérisé de l'eau sans Reta sur le site expérimental. A chaque fois les Goélands et les Cormorans sont revenus moins d'une heure après l'opération, se poser sur la digue, y compris sur la zone de traitement mouillée d'eau et y demeurer.

Dans un second temps, le traitement a été effectué avec une solution de Reta de 1 kg puis 2 kg pour 10 litres d'eau soit respectivement 44 et 88 g de Reta par m2 (440 et 880 kg par hectare), ce qui constitue des concentrations importantes.

L'ensemble des données et des observations relatives aux différents traitements se trouve dans le tableau joint en annexe.

Comportement des oiseaux.

Au cours de ces expériences, il a été admis que des oiseaux restant au contact du produit pendant 1 heure n'ont ressenti aucun effet nocif.

../..

La comparaison du nombre d'oiseaux posés avant le traitement et à T + tl + lh ; T : heure de la fin du traitement, tl : délai entre T et le retour du premier oiseau, ne fait apparaitre de façon significative un déplacement des oiseaux de la zone traitée vers les zones temoins.

D'autre part il est à remarquer que la stabilité de l'effectif de grands cormorans utilisant la digue comme perchoir se maintient après chacun des traitements. La diminution du nombre de cormorans entre le ler et le dernier traitement est seulement due au départ migratoire de la majorité de la population hivernante, entre le 24 et le 29 mars 1978.

Par contre il est intéressant de noter que l'augmentation du nombre de Goélands argentés sur la digue après chaque traitement provient exclusivement de l'arrivée sur le site dortoir de nouveaux oiseaux dont le nombre augemente au fur et à mesure que la nuit approche.

Après chaque traitement, les oiseaux venus se poser sur la zone traitée y sont demeurés plus d'une heure et entre deux épandanges successifs la zone traitée a été fréquentée avec regularité sans qu'il soit observée de modification dans le comportement des oiseaux. Cela donne à penser que les oiseaux qui n'ont pris contact avec le Reta que par l'intermédiaire des pattes n'ont ressenti aucune sensation susceptible de provoquer leur départ.

CONCLUSION.

A la suite de chacune des applications de Reta, aucune modification dans le comportement des oiseaux n'a été observée.

Dans les conditions expérimentales : épandage de Reta en solution aqueuse à forte concentration (44 g et 88 g de Reta par m2) sur un substrat de beton et prise de contact uniquement par les pattes, aucun effet répulsif du Reta n'a été constaté aussi bien sur des Goélands argentés que sur des Grands Cormorans.

La suite des tests en cours portent actuellement sur la recherche d'un effet répulsif du Reta vis à vis d'oiseaux prenant contact avec ce produit par l'intermédiaire d'autres parties du corps.

351

N°	Date	T	C	N1	N2	t1	N'1	N'2
1	8.03.1978	14H10	0	52 P 11 L	4 P 3 L	22mn 35mn	53 P 10 L	5 P 14 L
2	10.03.1978	14H00	0	54 P 7 P	0 P 11 L	40mn 30mn	52 P 12 L	3 P 22 L
3	15.03.1978	13H45	1 kg/101 44 g/m2	52 P 0 L	4 P 0 L	38mn 32mn	27 P 0 L	0 P I L
4	18.03.1978	14H05	1 kg/101 44 g/m2	61 P 3 L	3 P 2 L	50 mn 27 mn	56 P 7 L	2 P 9 L
5	24.03.1978	14H30	2 kg/101 88 g/m2	49 P 2 L	14 P 1 L	60mn 34mn	42 P 17 L	0 P 13 L
6	29.03.1978	14H10	2 kg/101 88 g/m2	6 P 37 L	0P 5L	28mn 30mn	5 P 47 L	0 P 11 L

Tableau : comportements des Goélands argentés et des Grands Cormorans après traitement du perchoir au Reta.

T : heure de la fin du traitement.

C : concentration par 10 l eau et m2

N1 : Nombre d'oiseaux avant traitement sur la zone de traitement

N2 : Nombre d'oiseaux avant traitement sur les zones témoins.

t1 : Délai entre T et retour des premiers oiseaux.

N'1 : Nombre d'oiseaux à t1 + 1 h sur la zone de traitement

N'2 : Nombre d'oiseaux à t1 + 1 h sur les zones témoins.

P : Grand Cormoran (Phalacrocorax carbo)

L : Goéland argenté (larus argentatus).

BIBLIOGRAPHIE

1. Stone R.J. — Synergised Aluminium Ammonium sulfate in the control of birds at Airports. BSCE 1976.

2. Stone R.J. — Development of the Theoretical construct of synergised Aluminium Ammonium Sulfate for the control of birds at Airports BSCE 1977.

3. DAR. G. — Compte rendu des essais effectués dans l'enceinte de l'Aéroport international Ben Gourion a Lod avec le "Bird Repellent Reta" BSCE 1976.

4. DAR. G. — Treatment for Repelling birds at Ben Gourion (LOD) International Airport, ISRAEL - BSCE 1977.

AOF616141

BIRD STRIKE COMMITTEE EUROPE

Inspection Générale de l'Aviation Civile.
246, rue Lecourbe - 75732 PARIS CEDEX 15
Tél. : 828-34-20

Bern, 29th May, 1978

Information Paper

(prepared by the Chairman of BSCE)

The members are informed that ICAO is holding, in Montreal, the 88th session of the air Navigation Commission from May 4, 1978 to, in principle, June 30, 1978.

The work Programme, amongst other items, includes :

Task No 4.16 - 1/60 Bird strikes to aircraft

Review of the Secretary's report on the consolidation and analysis of bird strike data collected from States related to airworthiness (ANC 83-27)

Task No 13.15 - 5/74 Bird hazard reduction

Review of the Secretary's proposals for further action on this subject (ANC 78-8)

The Committee is invited

a) to note that these items are related to B.S.C.E. current activities
b) to ensure that proper documentation is provided to each State representative in order to allow the ANC members to be fully aware of the possibilities
c) to do any action in order to be fully informed of the task already dealt with by ANC on the birds matters
d) to inform all W.G. and B.S.C.E. chairmen of the work and eventually decisions made by ANC.

- LE BIRD STRIKE COMMITTEE EUROPE ET LES ORGANISATIONS INTERNATIONALES. -

(par Melle Elisabeth DALLO).

Un article paru dans un magazine français "Air et Cosmos", en Décembre 1977 disait que le Bird Strike Committee Europe avait beaucoup souffert depuis sa création de ne pas être devenu un groupe de travail de l'O.A.C.I..

Il est apparu jusqu'à maintenant que les succès du B.S.C.E. ont résulté de la somme de bonnes volontés de ses Etats-membres et que, somme toute, cette bonne volonté a permis au Comité de fonctionner le mieux du monde.

Mais les juristes restent toujours méfiants lorsqu'ils se trouvent confrontés à un organisme qui ne répond pas aux critères habituels des organisations internationales. De fait, le B.S.C.E. ne résulte pas de la signature d'un accord international en bonne et due forme, et les décisions adoptées par les experts qui le constituent n'ont pas de force contraignante.

Ce qui a fait la force du comité jusqu'à maintenant pourrait, peut-être, par la suite, en faire sa faiblesse. Par ailleurs, la prise de conscience croissante par la Communauté internationale du danger que constituent les collisions entre les aéronefs et les oiseaux ont incité, peu à peu, les Organisations internationales s'occupant de l'aviation civile à s'intéresser à ce phénomène.

Sans porter de jugement préférentiel sur ces diverses organisations, ce document a pour but de rappeler et recenser, d'une part, le cadre juridique du fonctionnement de trois organisations, l'O.A.C.I., la C.E.A.C. et la C.E.E., et de faire le bilan des avantages que le B.S.C.E. pourrait trouver dans chacune de ces organisations.

ADF 61642

I.- O.A.C.I.-

L'Organisation de l'Aviation Civile Internationale a été créée par la Convention de Chicago du 7 Décembre 1944.

L'Organisation est entrée en fonction le 4 Avril 1947 après une période de fonctionnement provisoire d'une organisation intérimaire, l'O.P.A.C.I. (Organisation Provisoire de L'Aviation Civile).

L'O.A.C.I. qui regroupe actuellement tous les Etats ayant une importance aéronautique, (soit actuellement 141 Etats) est une institution spécialisée de l'O.N.U.. Si l'on cherche à la concrétiser par une formule synthètique, on peut dire que l'O.A.C.I. est une association d'Etats réunis sur un pied d'égalité, et coopérant en permanence, au moyen d'organismes collectifs dotés d'attributions étendues, pour augmenter la sécurité et l'efficacité des transports aériens.

Sa création, comme c'est le cas pour toutes les organisations internationales, s'accompagne de la renonciation par les Etats-membres, dans certains domaines, à l'exercice de certains droits de souveraineté.

Sans qu'il soit utile de rentrer dans les détails, il faut noter que la structure de l'O.A.C.I. est complexe.

Il s'agit tout d'abord d'une association d'Etats. Les organes de cette Association sont.:

- L'Assemblée générale, réunissant tous les Etats-membres sur un pied d'égalité, définit et sanctionne la politique générale de l'organisation.

- Le Conseil, organisme permanent, composé de 30 Etats-membres (nombre qui sera porté à 33 dès que 86 Etats auront ratifié la décision de la 21ème Assemblée Générale). La composition du Conseil assure une représentation équilibrée des Etats ayant une importance majeure dans le transport aérien, des Etats fournissant une part importante des installations et services de navigation aérienne, de la représentation géographique des Etats non-inclus à un autre titre.

Les travaux du Conseil sont préparés par les Commissions et Comités dépendant de lui : Commission de navigation aérienne (élaboration des "Normes", "Pratiques Recommandées" et "Procèdures"), le Comité de Transport aérien (Questions économiques).

.../...

- Comité juridique.

- Comité de l'aide collective aux Services de Navigation Aérienne.

- Comité des Finances.

- Divisions. Ce sont des réunions spécialisées d'experts convoqués par le Conseil en tant que de besoin.

- Conférence de navigation aérienne. Elles ont été inaugurées en 1953 et ont pour objet de traiter de sujets intéressant plusieurs Divisions.

Mais l'O.A.C.I. est aussi un Secrétariat permanent composé de cinq directions : Navigation aérienne, Transport aérien, Affaires juridiques, Assistance technique, Administration et Services. Le Secrétariat travaille en étroite collaboration avec le Conseil et les Comités.

L'Article 37 de la Convention de Chicago définit le rôle et les activités techniques de l'organisation :

"Chaque Etat contractant s'engage à prêter son concours pour atteindre le plus haut degré d'uniformité dans les réglements, les normes, les procèdures et l'organisation relatifs aux aéronefs, au personnel, aux voies aériennes et aux services auxiliaires, dans toutes les matières pour lesquelles une telle uniformité facilite et améliore la navigation aérienne."

Pour atteindre ces buts, l'O.A.C.I. dispose de plusieurs instruments juridiques :

- "Normes" : ce sont des spécifications dont l'application est reconnue <u>nécessaire</u> à la sécurité et à la régularité de la navigation aérienne internationale.

Les normes sont des dispositions obligatoires. En cas d'impossibilité de s'y conformer, notification doit en être faite au Conseil.

- "Pratiques recommandées" : ce sont des spécifications dont l'application est reconnue <u>souhaitable</u>. Comme les normes, elles sont adoptées par le Conseil à la majorité des deux-tiers des voix, mais à la différence des normes, elles n'ont pas de force contraignante.

- "Procèdures pour les services de navigation aérienne" et "procèdures complémentaires régionales". A la différence des normes et pratiques recommandées, elles ne font pas partie des Annexes à la Convention de Chicago, et laissent ainsi aux Etats un plus grand degré de liberté.

Il apparaît donc que les divers instruments juridiques de l'O.A.C.I. ont des degrés contraignants divers, et que même les dispositions les plus contraignantes peuvent ne pas être appliquées par les Etats dans la mesure où ils peuvent obtenir des dérogations par la notification de "différences" au Conseil.

II.- C.E.A.C.-

La Commission Européenne de l'Aviation Civile a été créée par la Conférence de Strasbourg en 1955. Cette création résultait d'une proposition du Conseil de l'Europe recommandant la convocation d'une conférence en vue d'examiner la possibilité de créer un organisme européen unique chargé d'exploiter, dans certaines conditions, les routes aériennes entre les Etats-membres.

La C.E.A.C. regroupe actuellement 21 Etats européens.

Depuis sa création, elle jouit d'un statut autonome, c'est-à-dire qu'elle n'est pas un organe subordonné et intégré à l'O.A.C.I. bien qu'elle entretienne des relations très étroites avec l'Organisation.

Elle établit son propre programme de travail, convoque ses propres réunions et prépare leur ordre du jour, tout en travaillant en étroite liaison avec l'O.A.C.I., et en utilisant les services de son Secrétariat en vertu des dispositions administratives et financières particulières.

La C.E.A.C. tient une Assemblée plénière tous les trois ans, et des Assemblées intermédiaires dans l'intervalle. Les décisions sont adoptées au cours des Assemblées.

Les Directeurs généraux de l'aviation civile se réunissent en "D.G.C.A." tous les deux à trois mois, sur un ordre du jour défini par le Comité de coordination.

Le comité est composé du Président de la C.E.A.C. (actuellement Monsieur HANS RABEN, Directeur Général de L'Aviation Civile Hollandaise), des vice-présidents et des présidents des 4 Comités permanents :

- Comité ECO I : transport régulier.

- Comité ECO II : transport non-régulier.

- Comité technique.

- Comité de facilitation.

Pour l'exécution du programme de travail qui leur est assigné, les Comités permanents créent des groupes de travail ou des groupes d'experts.

La C.E.A.C. a pour objet de suivre d'une façon générale l'évolution des transports aériens européens afin de favoriser la coordination, une meilleure utilisation et le développement ordonné de ces transports et d'examiner tout problème particulier qui pourrait se poser dans ce domaine.

Dans la définition de son programme de travail la Commission accorde une attention particulière à leur caractère spécifiquement européen et à la possibilité d'apporter une contribution réelle aux travaux permanents de l'O.A.C.I..

Les instruments juridiques dont dispose la Commission sont essentiellement les recommandations adoptées par les D.G.C.A. et les résolutions votées par les Assemblées plénières et intermédiaires. Mais, il faut souligner que même les résolutions n'ont pas de force obligatoire directe. Elles sont effectivement adoptées sous réserve d'approbation par les Gouvernements des Etats-membres.

III.- C.E.E.-

La Communauté économique européenne a été créée par le Traité de Rome de 1958. Depuis l'adhésion le 1er Janvier 1973 de trois nouveaux Etats, la Communauté regroupe neuf Etats européens.

La réalisation des tâches confiées à la C.E.E. est assurée grâce à l'existence de quatre institutions. Le Conseil réunit les représentants des Gouvernements des Etats-membres et se réunit en formation spéciale selon les sujets qui doivent être traités. C'est ainsi que les problèmes de l'aviation civile entrent dans l'ordre du jour du Conseil des Ministres des Transports. Le Conseil est assisté d'un organe permanent, le C.O.R.E.P.E.R. (Comité des Représentants Permanents des Etats-membres auprès de la C.E.E.). La Commission est composée de 13 membres désignés d'un commun accord par les gouvernements. Elle est gardienne du Traité et veille à cet effet au respect et à la correcte application de ses dispositions. Elle est aussi l'organe d'exécution de la C.E.E. et tire du Traité un certain nombre de pouvoirs propres.

.../...

Le Parlement formé de 198 membres est actuellement élu au suffrage indirect et assure le contrôle de la Commission, préservant ainsi l'indépendance de celle-ci vis à vis des gouvernements européens.

La Cour de justice composée de 9 juges désignés d'un commun accord par les gouvernements, assure le respect du droit communautaire. Elle statue sur les recours de la Commission contre les Gouvernements, des Gouvernements contre la Commission, et sur les recours de particuliers.

Les instruments juridiques dont dispose la C.E.E. sont au nombre de trois :

- Les réglements ont une portée générale, et sont obligatoires dans tous les éléments et directement applicables dans tout Etat-membre.

- Les directives lient les Etats-membres quant au résultat à atteindre, tout en laissant aux instances nationales le choix de la forme et des moyens.

- Les décisions obligatoires dans tous leurs éléments, mais uniquement pour ceux qu'elles désignent.

La C.E.E. a donc un véritable pouvoir juridique obligatoire puisque, avec certaines variantes, ses décisions lient les Etats-membres et viennent remplacer les droits nationaux.

IV.- RAPPORT DU B.S.C.E. ET DES ORGANISATIONS INTERNATIONALES.-

Les trois organisations dont il a été question jusqu'à maintenant sont très différentes, d'une part par le cadre géographique qu'elles recouvrent, d'autre part par les moyens juridiques dont elles disposent.

Le B.S.C.E. est déjà "entré en contact" avec ces trois organisations.

Récemment, (20-23 Mars 1978) l'O.A.C.I. a organisé une réunion laboratoire à Bangkok dont les objectifs principaux étaient de sensibiliser les Etats de la région aux possibilités de lutte contre le péril aviaire, de les informer sur l'organisation existant à l'échelle européenne, le B.S.C.E., et ainsi de les inciter à créer dans leur région une organisation similaire.

La tenue de ce Séminaire, qui ne devrait être que le premier d'une série de réunions régionales, a montré que l'O.A.C.I. était désormais sensibilisée au problème. En effet, il pourrait se révéler utile pour le B.S.C.E., d'utiliser

.../...

d'une part les moyens de fonctionnement bien rôdés et établis au sein de l'organisation internationale, et d'autre part de recourir lorsque le besoin s'en ferait sentir aux instruments juridiques qui ont été mentionnés dans la première partie, de telle sorte que le travail amorcé au niveau européen se poursuive à l'échelle internationale

:

Un contact a déjà aussi été pris entre le B.S.C.E. et la C.E.A.C.. Le Président du Comité européen a en effet dressé le bilan des travaux du B.S.C.E. au cours de la cinquième réunion du Comité technique de la C.E.A.C. au mois de Juin dernier. Le Comité technique s'est déclaré "prêt à faciliter, par tous les moyens possibles, la prise en considération des propositions que pourrait faire le B.S.C.E. en vue de leur approbation dans le cadre européen. Ceci visait notamment la présentation au Comité technique d'un document rassemblant les procèdures essayées et testées dans le cadre de l'environnement des aéroports et de la prévision des mouvements d'oiseaux en liaison avec les situations météorologiques.

Sans qu'il soit nécessaire de s'interroger dès maintenant sur la possibilité de relations plus formelles pouvant exister entre la C.E.A.C. et le B.S.C.E., il apparaît que la Commission européenne, par l'intermédiaire de son Comité technique, pourrait être ultérieurement utilisée et que les recommandations adoptées par le Comité européen pourraient être transformées en résolutions de la C.E.A.C. pour adoption au sein d'Assemblées générales.

Comme les deux autres organisations, la C.E.E. s'est aussi intéressée au problème aviaire encore que cet intérêt n'ait été que le corollaire de son souci de conservation des oiseaux.

La Commission de la C.E.E. saisit le Conseil en 1976 d'une proposition de directive concernant la conservation des oiseaux. Cette proposition ignorait les problèmes posés par la présence des oiseaux aux alentours des aéroports. Ce texte n'a été connu des spécialistes du transport aérien que dans sa phase finale, c'est-à-dire lors de la discussion au niveau du Conseil des Ministres. A l'heure actuelle, le projet est "en souffrance", mais plusieurs délégations, dont la délégation française, ont demandé que soit prévu un article particulier visant la dérogation à observer pour la protection de la navigation aérienne dans les zones aéroportuaires et les trouées d'envol.

.../...

A l'évidence il serait souhaitable que de tels projets puissent être connus, dès leur origine, des spécialistes du transport aérien. Pour ce faire, il serait souhaitable que dans la phase préparatoire, celle de préparation par la Commission d'une proposition de directive, les experts nationaux soient associés aux travaux.

Compte-tenu de la nature juridique "non officialisée" du B.S.C.E., il ne peut être envisagé de créer des relations formelles entre la Communauté et le Comité Européen. Par contre, le B.S.C.E. pourrait, au niveau de la Commission, assurer une liaison avec les instances communautaires, et, orienter les travaux de la Commission en harmonie avec les études menées dans d'autres instances internationales.

Discussion on WP 30

Thorpe: We have achieved rather good results in our capacity of an independent organization. I agree in this respect with the opinion of Miss Dallo. It's also an advantage for us that military air safety bodies take part in our work.

Ferry: I agree that it's a favour to have the military with us.

Richards: The content of the paper now presented is correct and of high value for the main lines of our work. It would be a pity if ICAO was now going to duplicate what have been done by BSCE.

Ferry: ICAO has published the report from the world conference on bird hazards to aircraft. We like to co-operate with ICAO and other international organizations.

Dahl refered to a state letter from the Air Navigation Commission of ICAO which had been issued recently. This document described the actual position of ICAO to the bird problems of aviation.

Thorpe: Since 1-2 years the atmosphere within ICAO is more positive regarding the bird problems.

Richards: The start with collection of bird strike statistics was an important step forward but ICAO did not fully know how to deal with it. There are also still some lacks from the side of BSCE when it comes to the utilization of bird strike statistics.

Thorpe: I have always kept ICAO posted about my work with analysis of bird strike statistics. They have now asked me to take over the analysis of their statistics.

BSCE 13 / WP 31

ADF616193

AIR FRANCE
DO.NI

MAI 1978

PERIL AVIAIRE

Préparation à la 13ème Réunion du
BIRD STRIKE COMMITTEE EUROPE
qui se tiendra à BERNE du 29 mai au 2 juin 1978

DOCUMENTS DE TRAVAIL

Propositions de Recommandations
établies par G.MARCAL - Inspecteur AIR FRANCE,
Membre de la Délégation Française au B.S.C.E. à BERNE.

1 - SUR LA NECESSITE URGENTE DE CREER UN DISPOSITIF D'INTERVENTION IMMEDIATE SUR LES AEROPORTS.

2 - SUR L'ADOPTION D'UN ORDRE DE CLASSEMENT DES CATEGORIES D'INCIDENTS, PAR DEGRE D'IMPORTANCE OU DE GRAVITE.

3 - SUR L'ADOPTION D'UN ORDRE DE CLASSEMENT DES CATEGORIES D'AEROPORTS, PAR DEGRE DE RISQUE PROGRESSIF OU DE DANGER AVIAIRE CARACTERISE.

LE RISQUE AVIAIRE ET LA SECURITE AERIENNE

/ PROPOSITION DE RECOMMANDATION N° 1 /

1 - SUR LA NECESSITE URGENTE DE CREER UN DISPOSITIF D'INTERVENTION IMMEDIATE SUR LES AEROPORTS

1.1 - Le contexte général

Nos appareils à réaction volent le plus souvent à des altitudes où n'évolue normalement aucun volatile.

L'espace critique de confrontation "avion/oiseaux" se situe donc, presque exclusivement, sur les aéroports et à leur voisinage, du sol au niveau des basses ou moyennes couches et concerne, dans l'immense majorité des cas, les phases de décollage et de montée, d'une part, celles d'approche et d'atterrissage, d'autre part.

Face à cet espace critique de confrontation, les administrations aéroportuaires concentrent leurs recherches, tout particulièrement depuis ces quelques dernières années, sur un programme général de protection, étudié à partir du sol de l'aéroport et son environnement.

Globalement, ce programme vise trois objectifs :

- Dissuader les oiseaux de séjourner sur l'aéroport, ou ses environs immédiats.
- Eloigner des trajectoires opérationnelles, les volatiles qui risquent de les intercepter en envolées importantes.
- Signaler préventivement aux Equipages (i.e. quelques instants avant le décollage ou lors de l'approche) toute concentration anormale et préoccupante d'oiseaux sur les aires de l'aéroport.

1.2 - Etudes et réalisations

De nombreuses études et expérimentations ont été entreprises par les Etats membres du B.S.C.E. au cours de cette dernière décennie.

Par ailleurs, les opérations agronomiques très diversifiées déjà réalisées sur bien des aéroports et leur environnement, le matériel et les moyens de dissuasion et d'effarouchement mis en place témoignent catégoriquement tout aussi bien de la prise de conscience collective à l'égard du risque aviaire, que de la ferme volonté des Administrations responsables de maintenir la permanence d'une sécurité aérienne qu'elles ont pour mission d'assurer.

Nous pouvons, en effet, constater que des dispositions d'application rapide ont déjà été prises par la plupart des Etats Européens sur leurs aéroports, en ce qui concerne la grande diversité d'utilisation du matériel d'effarouchement aviaire, aujourd'hui effectivement en vigueur.

1.3 - La faiblesse du système : Absence d'un dispositif d'intervention immédiate, structuré.

Pourtant, en dépit des nombreuses études et réalisations de spécialistes très expérimentés, des moyens les mieux adaptés à l'aéroport concerné, le nombre des incidents "Collisions d'oiseaux" sur les aéroports ou dans leur espace environnant, s'accroît, paradoxalement, d'année en année ....-

Pour sa part, la Compagnie AIR FRANCE avait subi :

. 17 Collisions d'oiseaux en 1976 ;

. Elle en subissait 23 en 1977.

Or, depuis janvier dernier jusqu'au 15 mai 1978, soit en 4 mois ½ seulement, elle en a déjà enregistré 17 ...

dont 3 incidents très graves,

et 1 incident très important !-

Nous ne devons donc pas, non plus, nous dissimuler l'extrême gravité de certains de ces incidents.

. Alors, quelle peut être la cause de ce paradoxe ?

. Que ce passe-t-il donc dans la réalité des circonstances rencontrées ?-

Certes, nous savons bien que le rythme accéléré de l'urbanisation en Europe, ainsi que l'extension intensive des surfaces nouvellement construites ou façonnées pour tous usages, réduisent de plus en plus sensiblement l'étendue des espaces libres indispensables et sécurisants pour les oiseaux.

Dans cette situation de plus en plus contraignante pour les volatiles, l'aire d'un aéroport représente pour eux un espace attractif, d'autant plus recherché qu'il peut être parfois contigu, ou se trouver à proximité d'autres zones naturelles : côtes, rivières, lacs, marécages, forêts, ...-

Et c'est ainsi que lorsque surviennent de très mauvaises conditions météorologiques générales ou régionales tout particulièrement, de considérables masses d'oiseaux viennent brusquement chercher refuge sur les aires d'un aéroport, constituant dès lors pour celui-ci, privé d'un système permanent de surveillance active, un nouveau danger d'autant plus important qu'il demeure temporairement insoupçonné, aussi bien par les services de contrôle que par les équipages ...-

Nous avons tous pu constater que la recrudescence des incidents "Collisions d'oiseaux" enregistrée au cours du premier trimestre de 1978 avait eu pour origine les effets des très mauvaises conditions météorologiques survenues sur l'Europe occidentale et méridionale au cours de ce trimestre.

..../....

Or, l'étude approfondie des circonstances qui se sont effectivement trouvées à l'origine de la plupart de ces incidents conduit à reconnaître que, trop souvent, cette nature de risque a été manifestement sous-estimée sur les aéroports :

- Surveillance occasionnelle des mouvements d'oiseaux sur les aires de l'aéroport ;
- Information très rarement communiquée aux Equipages, en temps opportun ;
- Défaillance de commandement pour intervention immédiate.
- Absence trop fréquente de personnel disponible et qualifié .
- Réticence marquée, voire refus, exprimé par des équipes supplétives, aux sollicitations éventuelles du Commandement de l'aéroport.

Aussi, sommes-nous persuadés que le rappel de la VIGILANCE sur les aéroports constitue, en tout premier lieu, le problème le plus urgent à résoudre.

Mais, tout d'abord, dans le cadre des moyens nécessaires, nous estimons qu'un dispositif d'intervention immédiate,structuré,doit être institué et mis en place très rapidement sur chaque aéroport, sous la responsabilité directe du commandement.

- Dans le contexte de la SECURITE GENERALE à assurer aux usagers à l'encontre de tous les accidents ou sinistres matériels, il apparaît normal que ce dispositif soit maintenu en permanence d'utilisation par le Service des Pompiers de l'Aéroport.
- Parallèlement aux équipes de pompiers actuellement en place, il pourrait se composer d'un petit groupe spécialisé d'intervention, avec véhicules et matériels adaptés aux actions systématisées d'effarouchement et de dispersion des oiseaux.
- Dès l'alerte radio transmise, le groupe d'intervention se porterait immédiatement vers la zone de fortes concentrations d'oiseaux signalée.
  - Il aurait pour mission d'utiliser les moyens les plus efficaces mis à sa disposition pour garantir le maintien de la libre circulation des aéronefs dans leur trajectoire d'atterrissage ou de décollage, et assurer ainsi la permanence de leur SECURITE.
  - Dans les instructions précises données à cet égard, il pourrait être spécifié que toute action de destruction partielle ou totale de concentrations d'oiseaux serait éventuellement effectuée à l'initiative du groupe d'intervention, dans le cas de nécessité extrême ou urgente jugée de nature à compromettre dangereusement la sécurité des aéronefs et de leurs occupants.
  - Il serait, de plus, bien précisé que dans ce cas de nécessité extrême ou urgente, l'action à déclencher pourrait également s'étendre aux espèces protégées de volatiles.

..../....

En conséquence, nous pensons que de nouvelles Recommandations Internationales, sous l'autorité du B.S.C.E. et de l'O.A.C.I devraient dans les meilleurs délais :

. Renforcer les textes actuels, en insistant sur la notion de VIGILANCE GENERALE requise auprès des Services Administratifs Aéroportuaires.

. Définir avec précision les différentes charges et fonctions à répartir auprès de ces différents services, en ce qui concerne :

- les moyens de détection des fortes concentrations d'oiseaux sur les aires de l'aéroport,

- les moyens d'éloignement, ou d'effarouchement, à utiliser dès besoins,

- les moyens d'information immédiate auprès des équipages,

- les moyens de diffusion rapide (BWM) de cette information, à l'attention des appareils pour lesquels la destination de l'aéroport est prévue.

. Exiger l'application rigoureuse des nouvelles instructions stipulées.

. Instaurer un nouveau dispositif structuré d'alerte et de prévention tel qu'il soit, à la fois :

- systématique, en ce qui concerne les moyens de détection, d'alerte, d'information et de diffusion,

- immédiat, en ce qui concerne les moyens d'éloignement ou d'effarouchement et, s'il le faut, dans le cas extrême de concentrations considérables d'oiseaux, ou de grande urgence avant un décollage ou un atterrissage, de destruction envisagée de volatiles, espèces protégées incluses.

- Il apparaît, en effet, de plus en plus nettement que c'est bien au niveau de la SURVEILLANCE que doivent assumer les Services Administratifs Aéroportuaires, de l'UTILISATION, à la fois systématique et immédiate des moyens mis en place sur les aéroports, que de graves anomalies, ou des défaillances, peuvent parfois se manifester. Elles peuvent se trouver ainsi à l'origine d'incidents,quelquefois très graves,au cours desquels l'éventualité d'un accident, lui-même, ne pourrait être exclu....-

1.4 - Conclusion

La plupart des enquêtes sur les incidents "Collisions d'oiseaux" en témoigne : l'absence, actuellement, d'un tel dispositif constitue réellement la faiblesse de l'ensemble du système de protection mis en oeuvre sur les aéroports, à l'encontre du risque aviaire.

Aussi, pensons-nous que nos commentaires, le rappel de nos observations, ainsi que de nos préoccupations auprès des Membres de cette Assemblée, seront de nature à mieux mettre en relief tout l'intérêt que peut représenter pour la sauvegarde de la Sécurité Aérienne notre proposition de recommandation N° 1 concernant la nécessité urgente de créer un dispositif coordonné d'intervention immédiate sur les aéroports.

/ PROPOSITION DE RECOMMANDATION N° 2 /

2 - SUR L'ADOPTION D'UN ORDRE DE CLASSEMENT DES CATEGORIES D'INCIDENTS PAR DEGRE D'IMPORTANCE OU DE GRAVITE.

2.2 - Les incidents "Rencontres d'oiseaux" par les avions.

L'examen des circonstances associées à chaque incident, aussi bien que le constat des effets, dommages et préjudices de toute nature qui en ont été, éventuellement, les conséquences, conduisent à reconnaître que les conditions et dommages rencontrés et subis se révèlent très différents, parfois même hors de proportions, d'un incident à l'autre.

- En effet, tel rapport d'incident signalera que l'avion est passé à proximité d'une concentration d'oiseaux, soit au sol, soit sous l'aspect d'une importante volée ou envolée, mais sans avoir subi le moindre impact.

  . L'incident, par lui-même, ne présente aucune conséquence fâcheuse, directe et immédiate, sur l'exploitation.

  . Il doit cependant constituer pour les organismes responsables, un véritable signal de mise en éveil de la surveillance permanente à assurer à l'égard de l'aéroport concerné.

  . Il représente donc un intérêt exclusivement d'information, mais, toutefois, d'information précieuse sur l'éventualité d'un danger latent susceptible de menacer l'aéroport.

- Tel autre rapport relatera que l'appareil a subi l'impact d'un oiseau moyen isolé, bien souvent non identifié quant à l'espèce. Les dommages se révèlent inexistants ou légers.

  . Celui-ci correspond à l'incident mineur d'exploitation.

  . Parallèlement, aucune autre conclusion ou déduction ne peuvent être induites de ce simple fait qui demeure à la fois le cas très exceptionnel, aléatoire et imparable.

Par contre, d'autres rapports exposent que l'incident s'est révélé beaucoup plus important, quant à ses dommages et conséquences.

Encore que ceux-ci se soient manifestés sous plusieurs aspects, plus ou moins cumulés d'ailleurs, au nombre desquels nous pouvons citer :

. les dommages matériels sur les superstructures de l'avion ;
. l'ingestion d'oiseau (x) par réacteur(s) ;
. une procédure opérationnelle brutalement interrompue ou modifiée ;
. une immobilisation importante au sol, de l'appareil ;
. l'annulation du vol, avec transfert des passagers ;
. la nécessité d'un convoyage technique ;

. sans oublier les conséquences fâcheuses de tous ces préjudices sur l'état d'esprit des passagers : impression pour le moins troublante d'insécurité, mise en cause de la ponctualité, désagrément d'un transfert d'avion, etc...-

Comment, dès lors, pouvoir établir une diversité de rapports exacts d'appréciation entre incidents, en fonction de leur fréquence d'occurrence sur tel aéroport, de leur importance relative, de leurs caractéristiques essentielles associées aux circonstances rencontrées : situation météorologique, espèce d'oiseaux concernée, cumul possible de conditions momentanées défavorables, de l'étendue de leurs dommages respectifs, etc ... -

- Un ordre de classement sélectif des incidents, dans lequel se trouve intégré tous les éléments que nous venons de rappeler peut permettre à la fois :

  - une discrimination catégorielle, bien significative de l'importance relative attribuée à chaque incident par l'organisme responsable ;

  - une visualisation réaliste immédiate des rapports qualitatifs et quantitatifs d'un ensemble d'incidents que cherche à considérer et à apprécier, tout d'abord globalement, le consultant ou le lecteur.

De telles considérations ont naturellement amené la Compagnie AIR FRANCE à réaliser, depuis 1975, un ordre de classement progressif des incidents de cette nature, compte tenu de leur degré d'importance ou de gravité.

Pour une meilleure appréciation de ses propres statistiques, il lui était ensuite facile de généraliser rétroactivement cette nouvelle méthode de classement depuis l'année 1971.

Cet ordre de classement progressif, que nous rappelons ci-après, se compose de 5 index représentatifs couvrant tous les cas signalés, qu'il est, dès lors, possible d'attribuer aux incidents "RENCONTRES D'OISEAUX", après examen de leur degré d'importance, de leurs gros préjudices sur l'exploitation, voire de leur gravité concernant la sécurité des personnes transportées, comme suit :

A - Nombreux oiseaux rencontrés à proximité de la trajectoire de l'appareil, mais sans impact.

B - Rencontres d'oiseau(x) avec 1 ou plusieurs impacts, mais sans dommages matériels apparents, et n'ayant occasionné aucun retard d'exploitation, ou tout autre préjudice.

- Ensuite, 1 ou plusieurs impacts ou ingestion(s) d'oiseau(x) par réacteur(s) :

C - Ayant occasionné des dommages matériels, ou des retards ou préjudices d'exploitation appréciables. (Ex. : radôme endommagé, régime/moteur(s) perturbé en vol, procédure de départ retardée pour vérification ou nettoyage : retard : 1 h 30, etc ....).

..../....

D - Ayant occasionné des dommages matériels ou/et des retards ou préjudices d'exploitation importants (Ex. : grosses réparations ou changement du réacteur, PAX transférés sur vols suivants, suite annulation courrier. Retour sur l'escale après l'impact ou l'ingestion, appareil immobilisé une journée ou plus, convoyage technique, etc ....)

E - Ayant brusquement mis en cause la sécurité de l'appareil et de ses occupants, et occasionné des dommages matériels ou/et des retards d'exploitation importants (Ex. : grosses réparations ou changement du réacteur, PAX transférés sur vols suivants, suite annulation courrier. Retour sur l'escale après l'impact ou l'ingestion, appareil immobilisé une journée ou plus, convoyage technique, etc ....).

Suivant cet ordre de classement sélectif, la Compagnie AIR FRANCE a réalisé, pour son propre compte, le classement progressif de ses incidents depuis 1971 sous forme du tableau synoptique ci-après, que nous exposons à titre d'exemple caractéristique - convaincant, pensons-nous, quant à sa rapidité de visualisation.

Dans ce tableau, il a été ajouté les 19 incidents "Rencontres d'oiseaux" signalés par les équipages de la Compagnie Nationale AIR FRANCE, du 1er JANVIER au 15 MAI 1978, soit sur 4 mois ½ seulement, comme suit :

CATEGORIE D'INCIDENT RETENUE	1971	1972	1973	1974	1975	1976	1977	du 01.01.78 au 15.05.78 (soit 4 mois ½)
A	1	2	2	2	3	5	6	2
B	25	10	9	9	13	7	20	10
C	18	6	1	7	1	5	3	3
D	8	9	5	5	1	2	-	1
E	-	-	2	4	4	3	-	3
TOTAL ANNUEL	52	27	19	27	22	22	29	19

Exposé général/AIR FRANCE

En ce qui concerne les incidents graves (catégories D et E), nous constatons à la lecture de ce tableau :

- une apparition de ces 2 catégories d'incidents en 1973 : 7 cas
- un accroissement du nombre de ces 2 catégories en 1974 : 9 cas
- ensuite, la diminution importante de ce nombre en 1975 : 5 cas
- et son maintien en 1976, : 5 cas
- puis, une disparition totale du nombre de ces incidents graves en 1977 (mais avec un accroissement quantitatif global annuel du nombre d'incidents signalés : de 22 en 1976, à 29 en 1977). -

. Enfin, brutalement, depuis le début de 1978, nous enregistrons une augmentation très importante du nombre d'incidents, avec réapparition des incidents graves et très graves comme nous les avions déjà subis, surtout de 1973 à 1976, et tout particulièrement en ce qui concerne la Catégorie E.

Parmi les incidents les plus graves, survenus depuis janvier 1978, sont à signaler :

. 1 incident grave : catégorie D, lors de l'atterrissage à BAGDAD, le 14.02.

. 3 incidents très graves ; catégorie E, au décollage tous trois : à HOUSTON, le 22.01 - à LYON-SATOLAS, le 18.02 - à PARIS-CDG, le 16.03.

Devant ce nouvel exemple, très préoccupant, qu'illustrent les 4 premiers incidents graves de ce premier trimestre de 1978, une question se pose : ces 4 aéroports avaient-ils déjà fait l'objet d'autres incidents "Rencontres d'oiseaux" au cours de 1977 et au début de 1978 ?

Cette question conduit, tout d'abord, à examiner à son tour l'aéroport considéré.

Après toute étude minutieuse concernant celui-ci, elle débouche nécessairement sur l'intérêt d'élaborer un second ordre de classement des catégories d'aéroports, par degré de risque progressif ou de danger aviaire caractérisé.

C'est dans cet ordre général de classement que l'aéroport examiné pourra obtenir le classement - temporaire - qui paraît le mieux lui convenir, en fonction des éléments "Risques Aviaires" qui ont déjà été relevés à son égard.

Il est évident que cette attribution de classement demeure évolutive à terme, l'aéroport pouvant, soit améliorer sa situation "critique" sur le plan aviaire, soit, bien au contraire, la détériorer, dans l'éventualité où d'autres incidents de même nature et peut-être plus graves, seraient ultérieurement survenus dans son espace.

Ce second ordre de classement fait précisément l'objet de notre proposition de recommandation N° 3, ci-annexée.

En ce qui concerne, toutefois, notre proposition de recommandation N° 2 relative à l'adoption d'un ordre de classement des catégories d'incidents par degré d'importance ou de gravité, nous pensons que dans un souci de simplification générale des exposés statistiques au sein du B.S.C.E., il serait judicieux d'envisager son utilisation courante, comme l'utilise déjà la Compagnie Nationale AIR FRANCE depuis plusieurs années, en accord avec les Services Administratifs Français de la DNA et de l'IGAC.

/ PROPOSITION DE RECOMMANDATION N° 3 /

3 - SUR L'ADOPTION D'UN ORDRE DE CLASSEMENT DES CATEGORIES D'AEROPORTS, PAR DEGRE DE RISQUE PROGRESSIF OU DE DANGER AVIAIRE CARACTERISE -

Compte tenu de ce que nous venons d'exposer dans le texte de recommandation N° 2, il apparait à la fois nécessaire et complémentaire, dans l'éventualité d'adoption d'un ordre de classement des catégories d'INCIDENTS, d'utiliser corollairement un second ordre de classement des catégories d'AEROPORTS, établi par degré de risque progressif, voire de danger aviaire caractérisé.

Ce second classement doit susciter plusieurs facteurs d'intérêt :

- Concentrer la vigilance des Organismes Administratifs responsables de chaque Etat sur quelques aéroports, sur lesquels un risque aviaire caractérisé subsiste ou réapparait.
- Sensibiliser au maximum le Commandement de l'aéroport concerné sur le danger latent qui persiste à menacer la sécurité du trafic aérien placée sous la protection de son autorité.
- Informer plus catégoriquement les Directions des Compagnies Aériennes sur la part de risque relatif que représente réellement tel aéroport dans le suivi de leur exploitation ; mieux leur permettre ainsi d'entreprendre toute démarche ou requête auprès des Services Administratifs responsables pour obtenir rapidement une amélioration de la situation actuelle,avant que ne survienne tout autre incident.
- Edifier clairement les Commandants de Bord sur le degré du risque aviaire relatif que certains aéroports peuvent constituer dans la poursuite de leurs vols ; mieux les inciter ainsi :
  - à assurer une meilleure surveillance des lieux au cours de leurs phases d'approche et d'atterrissage, et avant d'entreprendre leur décollage ;
  - à demander au Contrôle toute assistance ou intervention immédiate des Services de Sécurité au sol, spécialement constitués à cet effet.

Toutefois, l'examen des différentes conditions suivant lesquelles peut se caractériser un aéroport dans le contexte du risque aviaire qui le menace, et surtout, l'appréciation du degré de risque qu'il représente demeure délicate et reste soumise à des modifications périodiques, ou beaucoup plus durables selon chaque cas particulier étudié.

Dans ce domaine, en effet, rien n'est systématique. Tout, par contre, semble se jouer et se traduire en facteurs et probabilités de risque estimés en fonction de la connaissance approfondie acquise à l'égard de l'aéroport concerné : suivi permanent de son exploitation, de ses problèmes ornithologiques locaux ou régionaux, de son environnement comme de son climat, enfin de l'étendue des moyens de prévention et de protection aviaire mis en place par les organismes officiels,... sans oublier le respect de la vigilance indispensable et règlementaire des Services au sol responsables.

.../...

C'est ainsi que suivant les études effectuées sur les 4 derniers incidents graves subis par ses appareils depuis Janvier 1978 : BAGDAD, HOUSTON, LYON-SATOLAS et PARIS-CDG, la Compagnie Nationale AIR FRANCE a voulu répondre à sa propre question : Ces 4 aéroports avaient-ils déjà fait l'objet d'autres incidents "Rencontres d'oiseaux" au cours de 1977 et au début de 1978?...-

Pour BAGDAD et HOUSTON la réponse est négative. Bien plus, un contrôle complémentaire confirme également que ces 2 aéroports n'avaient fait l'objet d'aucun incident antérieur AIR FRANCE de cette nature depuis Janvier 1975.

Par contre, depuis janvier 1977, plusieurs incidents "Rencontres d'oiseaux", sans gravité (catégories B et C) (et, en ce qui concernait LYON-SATOLAS, apparemment, sans aucun problème préoccupant d'importantes concentrations d'oiseaux), avaient déjà été signalés par les Equipages d'AIR FRANCE sur les 2 autres aéroports, comme suit :

<u>LYON-SATOLAS</u> : <u>2</u> incidents antérieurs :

. le 08.03.77 - B.727 - En descente sur Lyon, à 7000 ft.
Impact avec oiseau isolé - Incident classé CATEGORIE <u>B</u>.

. le 25.06.77 - B.727 - A l'atterrissage (avant le touchdown).
Impact dans une volée de buses (4) - Incident classé CATEGORIE <u>B</u>.

<u>PARIS-CDG</u> : <u>5</u> incidents antérieurs :

. le 25.01.77 - B.707 - Au décollage, sur piste.
Plusieurs impacts avec pigeons - Incident classe CATEGORIE <u>B</u>.

. le 14.02.77 - A.300 B - En approche, à 5000 ft.
Impact avec oiseau moyen isolé - Incident classé CATEGORIE <u>B</u>.

. le 09.03.77 - SE 210 - En descente sur CDG.
Impact avec gros oiseau isolé - Incident classe CATEGORIE <u>C</u>.

. le 10.01.78 - B.747 - Au décollage, sur piste.
Plusieurs impacts avec mouettes - Incident classé CATEGORIE <u>B</u>.

. le 11.03.78 - A.300 B - En montée, à 10 000 ft.
Plusieurs impacts avec étourneaux - Incident classé CATEGORIE <u>C</u>.

A la lecture de ce qui précède, il apparait que chaque aéroport présente lui-même une probabilité bien particulière de risque aviaire, en fonction de plusieurs critères à considérer : sa situation géographique, les phénomènes aviaires migratoires qui l'affectent (migrations continentales ou régionales périodiques, et/ou micro-migrations locales quasi-permanentes), l'importance relative des groupes ou concentrations d'oiseaux qui y séjournent, la pluralité éventuelle des espèces concernées, la fréquence des incidents que les Equipages signalent sur chacun d'eux, l'importance relative de ceux-ci, les circonstances rencontrées, enfin les moyens de prévention et/ou de protection mis en oeuvre par les Services officiels aéroportuaires.

.../...

330

D'où l'impérieuse nécessité de réaliser globalement cette fois, au niveau des aéroports, un classement sélectif particulier de probabilité de risque aviaire concernant tous les aéroports, ce classement présentant ensuite l'avantage de sélectionner les aéroports sur lesquels persiste un risque aviaire caractérisé.

Après l'analyse minutieuse d'un ensemble de facteurs très différents à considérer, nous avons établi l'étude de synthèse adaptée à tous les cas rencontrés, puis nous avons réalisé un ordre de classement des catégories d'aéroports en fonction de la probabilité de risque théoriquement encouru par chacun d'eux.

Par souci de méthode analogique dans l'élaboration des deux ordres de classement, nous avons également établi ce second classement de risque progressif suivant 5 index représentatifs, couvrant toutes les situations temporaires d'aéroports.

Comme nous l'avons déjà indiqué, l'attribution de l'un de ces index à tout aéroport demeure susceptible de modification - annuelle ou périodique - en fonction de l'évolution du contexte général qui le concerne.

ORDRE DE CLASSEMENT DES CATEGORIES D'AEROPORTS

Classement AIR FRANCE, au 01.01.1978, des catégories d'aéroports à l'égard de chacun desquels :

A : aucun incident "Rencontres d'oiseaux" n'a encore été signalé à ce jour par les Equipages - ni aucune information préoccupante en ce qui concerne le séjour d'oiseaux sur l'aéroport, en quantité importante.

B : un seul incident, ou de très rares incidents depuis plusieurs années ont été signalés (sans dommages ou de faible importance), ceux-ci ayant été occasionnés par des oiseaux isolés ou en très faible groupe, exclusivement.

C : de rares incidents ont été signalés, ceux-ci ayant été occasionnés soit par des oiseaux isolés, soit par de petits groupes de volatiles (nombre estimé $\leqslant 10$, avec ou sans impact) ne constituant absolument pas de problème de concentrations importantes d'oiseaux, périodiques ou permanentes, sur les aires de l'aéroport, ou à ses abords immédiats.

D : plusieurs incidents, plus ou moins importants, ont déjà été signalés, les collisions subies par les appareils ayant eu lieu lors d'interceptions d'envolées d'oiseaux nombreux, associées à des concentrations importantes, périodiques ou permanentes, de volatiles sur les aires de l'aéroport ou à ses abords immédiats, et/ou, dès réception d'une information (d'Equipage, de l'aéroport concernée, des Services officiels...) faisant état de fortes concentrations d'oiseaux sur les aires de l'aéroport, à ses abords immédiats, ou dans une zone environnante particulièrement attractive pour les volatiles : côtes, marais, cours d'eau, lac, étang, décharges urbaines ou maraîchères importantes, émissaires maritimes d'égouts, etc...

.../...

Ce classement de risque important sera maintenu pour l'aéroport concerné, en dépit des moyens de prévention ou de protection aviaire mis en oeuvre par les Services officiels sur l'aéroport, aussi longtemps que persisteront les concentrations importantes d'oiseaux antérieurement signalées sur les aires de l'aéroport, à ses abords immédiats, ou dans les zones environnantes particulièrement attractives pour les volatiles.

E : Plusieurs incidents importants et/ou un incident grave au moins, ont déjà été signalés, les collisions subies par nos appareils ayant eu lieu lors d'interceptions d'envolées d'oiseaux nombreux, associées à des concentrations importantes, périodiques ou permanentes, de volatiles sur les aires de l'aéroport, ou à ses abords immédiats.

Ce classement de risque maximal sera maintenu pour l'aéroport concerné, en dépit des moyens de prévention ou de protection aviaire mis eu oeuvre par les Services officiels sur l'aéroport, aussi longtemps que persisteront les concentrations importantes d'oiseaux antérieurement signalées sur les aires de l'aéroport, à ses abords immédiats, ou dans les zones environnantes particulièrement attractives pour les volatiles.

Ce classement met, lui-même schématiquement en relief 3 grandes catérories de cas à discriminer :

1. Les aéroports sur lesquels aucun risque aviaire caractérisé n'est à craindre : Catégories A et B.

   Nous y incluons la catégorieB, un impact avec un oiseau isolé demeurant toujours possible dans l'environnement de tout aéroport et représentant à la fois le cas très exceptionnel, aléatoire et imparable.

2. Les aéroports sur lesquels peut exister un léger risque aviaire : Catégorie C.

3. Les aéroports particulièrement critiques et préoccupants, Catégories D et E, à l'égard desquels toutes dispositions indispensables et systématiques doivent être prises dans les meilleurs délais par les Organismes Administratifs responsables, soit :

   - Moyens efficaces de prévention et de protection mis en oeuvre sur l'aéroport, à l'encontre du risque aviaire.
   - Information systématique à fournir aux Equipages en phase d'approche, ou en instance de décollage, sur toute concentration importante d'oiseaux sur les aires de l'aéroport, ou à ses environs immédiats.
   - Constitution d'un groupe spécialisé d'intervention sur l'aéroport susceptible :
     - d'être alerté immédiatement par les Services du Contrôle ;
     - de se transporter aussitôt vers la zone de concentrations signalée -
     - de pouvoir rapidement : éloigner, neutraliser ou détruire les masses importantes d'oiseaux qui s'y trouvent, afin d'éliminer tout risque d'impact aviaire sur la piste utilisée et les trajectoires de décollage, d'approche ou d'atterrissage de l'aéroport.

     (Cf. note première proposition de recommandation sur la nécessité urgente de créer un dispositif d'intervention immédiate sur les aéroports) -

CONCLUSIONS

Comme nous l'avons développé, cette troisième proposition compose le troisième volet du triptyque d'un système coordonné dans lequel se trouvent réunis et intégrés, en étroite relation avec tous les moyens déjà mis en oeuvre :

. l'action immédiate de protection, suivant une formule à généraliser à l'échelon Européen -

. le classement synoptique :

- des INCIDENTS, au niveau de leur importance respective exacte ;

- des AEROPORTS, en fonction du degré de risque aviaire relatif qu'ils doivent représenter potentiellement pour les Commandants de Bord .

En conséquence, nous pensons qu'il serait évidemment souhaitable que ces trois propositions demeurent associées et complémentaires dans l'éventualité de leur adoption.

Elles présenteraient, par ailleurs, si elles étaient retenues par le B.S.C.E., l'appréciable avantage de constituer, pour l'ensemble des Etats membres, un langage commun d'action coordonnée, de méthode et de synthèse pratiques et claires, de nature à faciliter les échanges et dialogues entre Etats participants.

AIR FRANCE/DO.NI
MAI 1978
G. MARCAL

Discussion on WP 31

After his presentation of working paper No 31 Mr Marcal delivered three proposals to the Meeting.

Proposal No 1: It should be the responsibility of the fire-brigade at an airport to turn out with staff and scaring equipment if there are birds on or near any runway.

The reason for this proposal is that if there is some kind of bird patrol at an airport it will be possible for that patrol to intervene much faster if there are birds on the runway.

Proposal No 2: Bird strikes should be classified according to their degree of danger for aircraft.

Proposal No 3: Airports should be classified according to their degree of risk concerning danger from birds.

Ferry explained the contents of the above mentioned proposals. The purpose with proposal No 3 is not to make any "black listing" of some airports but to make pilots more aware of the risks with birds in airports.

Pierre: Will it be possible for air traffic controllers to take measures about these problems? For my part I think that air traffic controllers are in many places already overloaded with work and we can't expect them to help us with our difficulties.

I would like to look upon BSCE as a neutral, technical committee when these questions have to be dealt with.

Thorpe: Much people and organizations will look at a possible realization of this proposal as a black listing. I am also afraid of a deterioration of the bird strike reporting.

Pierre: The reporting system also depends on reports from airlines.

Ferry: Is it possible for the aerodrome working group to take care of this working paper and consider the proposals?

Pedersen: Yes it's possible to do so and also to consult John Thorpe concerning statistical problems related to these matters. After handling in the aerodrome working group these proposals can be put forward again at next BSCE-Meeting.

SOME NOTES ON ANALYSIS OF BIRD STRIKES TO UK GENERAL AVIATION AIRCRAFT

1968 - 1977

(Aircraft of weight less than 5,700 Kg)

J Thorpe - United Kingdom

1. In the 10 years there were 400 reported strikes. This is about one seventieth of the rate for aircraft of over 5,700 Kg.

2. The birds struck are similar to those struck by the large aircraft group (in brackets), Gulls 54% (53.2), Lapwings 18% (12.1), Pigeons 9% (6.0), Swallows 3% (3.6). Two large birds, a Greylag goose (Anser anser 3.2 Kg) and a Gannet (Sula bassana 3.5 Kg) were struck, in each case very considerable structural damage was done.

3. 50% of strikes to light aircraft are during landing, and 44% during take-off and climb. These percentages are identical to those for the large aircraft group. During cruise 4% of strikes occurred, compared with 2.1% on large aircraft, almost certainly due to the small aircrafts' lower cruise altitude.

4. It is not possible to determine if there is a difference between all-grass and other aerodromes.

5. The airspeed at which the birds are struck is markedly different from large aircraft, 55.3% of strikes were below 80 kts, compared with 20.6% on large aircraft. It was noticeable that 21% of strikes were below 60 kts, it may be that the quieter and smaller general aviation aircraft do not provide the same alert response in birds.

6. 85% of strikes are between ground level and 200 ft, with only 1% above 2,500 ft. These are similar to the large aircraft group.

7. The parts struck were very different from large aircraft, the wing accounting for 33% of strikes (compared with 16.5%).

	General Aviation Aircraft	Large Aircraft
Fuselage	6%	13%
Nose/Radome	11%	32%
Windscreen	11%	14%
Engine/Propeller	23%	19%
Wing	33%	16.5%
Landing Gear	11%	5%
Empennage	3%	1%

As could be expected on single-engined aircraft the propeller/engine are struck rather than the nose.

ADF616 144

8. On large aircraft only 18% of strikes cause damage, whereas on general aviation aircraft 23.5% of strikes cause damage. The major effects were skin denting in 12% of strikes, however 9 incidents involved structural deformation. There were 4 cases of windscreens being smashed, 2 of them causing minor injuries to the pilot. A gyrocopter was ditched in the sea when severe vibration was experienced immediately after passing through a flock of gulls.

9. The monthly variation is almost identical to that on large aircraft. August is the worst month for strikes, the same as for large aircraft, the flying peak coinciding with the bird population peak.

Discussion on WP 32

Bruderer: Is perhaps the frequency of bird strike reports so low because cases with severe damage are quite rare?

Thorpe: That is likely.

PRACTICAL AND ECONOMICAL ASPECTS OF GRASSLAND MANAGEMENT AT SOME DUTCH AIRBASES

Ir. J. HEIJINK AND Drs. L.S. BUURMA RNALF

Introduction.

In a densely populated country like Holland almost all suitable grasslands are used for agricultural production. There are in Holland hardly no marginal ground or waste land. This intensive management also streches out to grasslands on airfields.

During the last ten years the number of local birdstrikes is growing mainly because of the strong intensification of agricultural production in Holland.
Intensification of grass-management means:

- increase of use of fertilizers and organic manure
- increase in yields of grass or hay per hectare
- increase in number of cuttings a year
- increase in length of periods with "short" grass.

However, birds are attracted by each single cut and also by the other following agricultural activities. Several bird species, like gulls and lapwings, are specialists feeding themselves on grass-stubble or a field where organic manure is spread. These gulls react even on the agricultural machines as soon as they leave the farm. The trouble some species are so-called "opportunistic feeders". These species make use of every easy feeding occasion. They "hop" from one site to another and therefore cause a high level of bird-flying activity.

The aim of this report is to show the conflict between modern agricultural development, the value of fertile soils, and flight safety measures. Besides preventing "en route"-birdstrikes, the best way to solve this problem is by making airfields unattractive to birds. How a few things are solved and will be solved in Holland on military airfields will be explained with the following example. This concernes Leeuwarden airbase in the north of the country, not far away from the coast. The soil consists of heavy marine clay (40 - 50% clay particles) and the water table is articicially held 1 m below groundlevel. Vegetation mainly consists of Elytrigia repens, Poa pratensis, Taraxacum species, Dactylis glomerata, Lolium perenne and Phleum pratense. On this airbase, grass is mowed for dried grass, silage or hay by local farmers. The surroundings of the airbase consist of pastures and meadows with no arable land. Farmers only have diary cattle on their own fields; cows are not allowed on the airbase. Only mowing of grass on the airbase is permitted. Five or six cuttings a year are possible. No organic manuring is allowed.

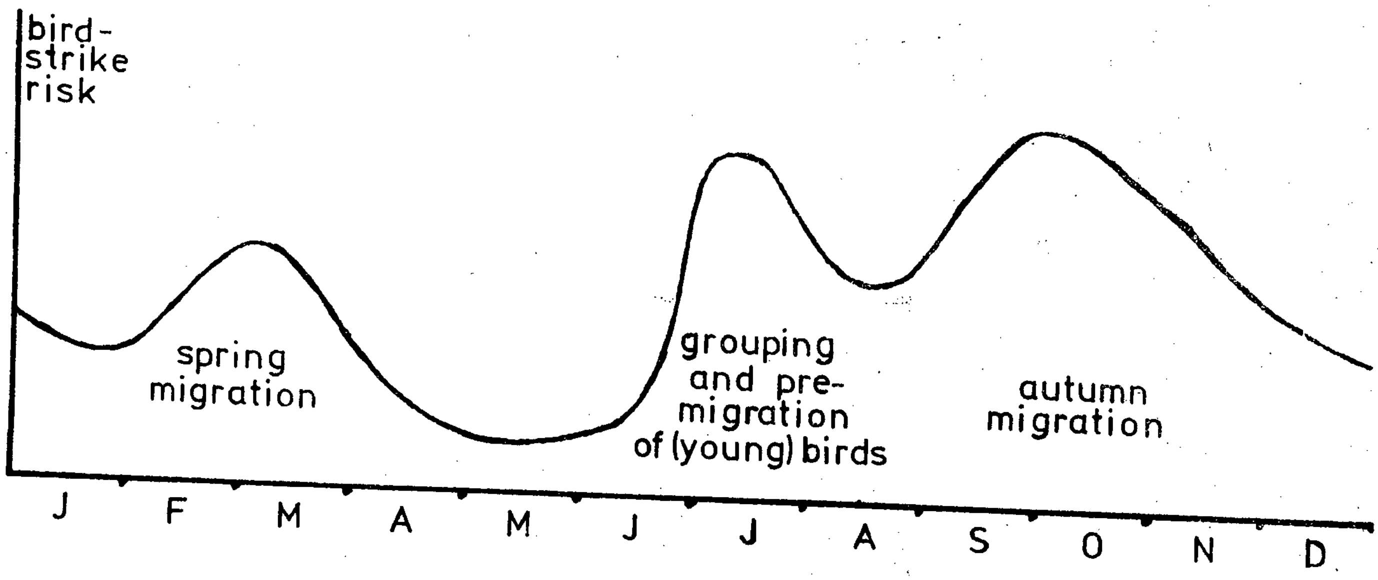
Ornithological aspects.

Most "local" birdstrikes occur during summertime in the months June, July and August, when young unexperienced birds are able to fly and gather on places with much food before migration starts. Also "premigration" from neighboring countries to the food-rich Dutch lowlands occurs. On the other hand, the breeding season is the less dangerous period.

Birds are mostly on their nests outside the airfield. During migration time, suddenly large flocks of birds can alight on an attractive field for roosting or feeding. In a diagram the bird-activity during a year on an airfield looks like:

Fig 1

GLOBAL ESTIMATION OF BIRD ACTIVITY ON AN AIRFIELD



Factors causing attractiveness of the sward for birds.

Every agricultural operation on grassland, like mowing, hay making, ploughing, manuring, can make food available (soil-macrofauna and insects) to birds. Many bird species are mainly specialized on these agricultural activities of human beings (farmers). For this reason it is necessary to minimize these activities on an airfield.

There are indications that high-productive grasslands have a higher absolute number of food possibilities for some common and dangerous bird species than low-productive, extensively used grassland, like twenty years ago, before the increase of fertilizer usage.

The mowed swatch laying on the ground can attract macrofauna during periods of rainfall. After mowing the grass has to be collected and removed from the airfield immediately.

A short stubble after mowing also attracts birds. Birds feel safe because they can look around and easily see coming danger. Birds can also feed themselves more readily on a short stubble. A rich sourse of food is easily available. Periods with short grass need to be as short as possible and should not occur many times a year.

Grass plants stay in a healthy condition and deterioration of the botanical composition of the sward does not happen, when the first cut in the month May is carried out in the normal way. This means a cut at 5 - 7 cm above groundlevel. Most birds are breeding at that time, so they are either territorial or in the colonies far away from the airfield.

Long grass during wintertime is not recommended. A deterioration of the sward could take place. An optimal length during wintertime of ± 10 cm is proposed.

Measures to reduce attraction of birds.

Measures to reduce bird attraction are:

- slow decrease of all agricultural operations
- keeping periods of short stubble as short and as infrequent as possible especially in the most dangerous parts of the season
- immediate removal of grass after mowing
- mowing of large areas in a short period to have a dispersal of birds and no concentration on small parcels resulting in the movements of birds from one to another.

Practical solution.

A solution for this problem of bird attractiveness is an adjustment of agricultural management. This means not a sudden total change in management. Removal of grass is for several reasons always necessary. Only mowing of grass to a height of 15 - 20 cm above groundlevel with a horizontal rotor mower without removal of mowed grass: the so-called "long grass"-method can not be realized on this fertile high-productive soil in a wet oceanic climate.

Complications, which could occur by using the "long grass"-method, are:

- a sward with an open structure caused by accumulation of debris
- on some places total death growth of the sward
- loss of ability of the turf to bear heavy trucks during a rain period
- constant addition of organic matter can raise new problems
- stimulation of small mammals like mice and voles, which attract birds of prey and herons
- no financial profits
- for military airfields in a grass-area, no camouflage by a differentiated mowing cycle is possible.

Due to these complications we made a new management scheme for this airbase consisting of removal of grass production. Local farmers can cooperate and process the grass for silage or dried grass. Only hay making is forbidden. Total yearly grass production and the number of cuttings a year is lowered by decreasing and maximizing the use of N-fertilizers. N(itrogen) stimulates grass growth and the number of cuttings a year. Possibilities are shown in the following scheme (Fig. 2).

Aspects of the execution.

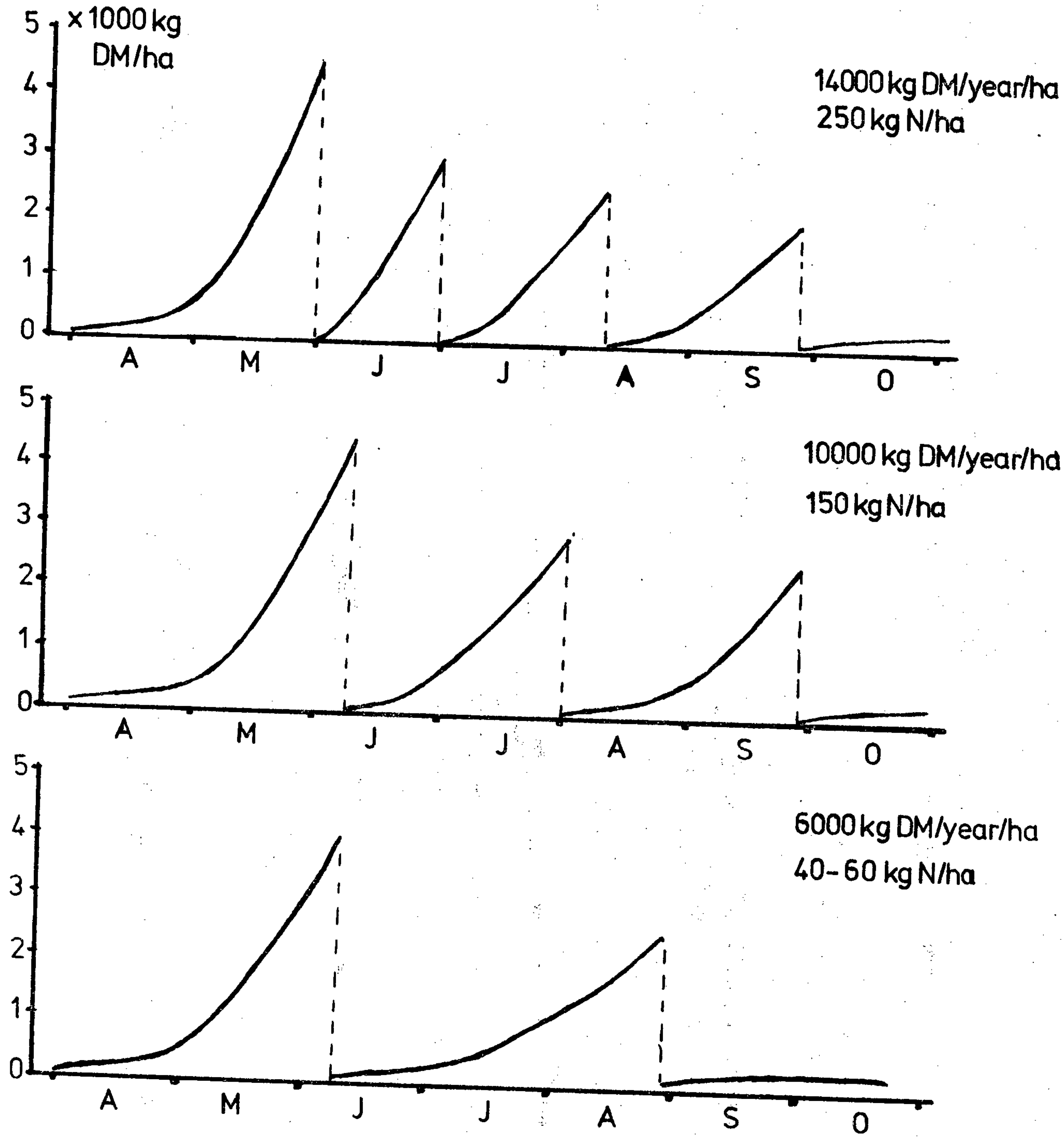
The following restrictions were proposed and accepted:

- an area 100 m wide running each side and parallel with the runways and on the overshoot areas is mown twice a year
- the rest of the airfield is mown three times a year
- systematic manuring is done early in spring and after each cut except the last one
- grass has to be mowed for the first time just before flowering of grasses to retain a suitable sward composition

- the second cutting, concerning the management with three cuttings a year, has to be done at a height of 10 cm above groundlevel to have a quickly regrowing sward
- at the end of september the last cut has to be carried out.

Finally, some economical aspects concerning 150 ha grassland are shown. A comparison is made when the whole area is extensively (2 cuttings a year) and intensively (4 - 5 cuttings a year) used. In all cases, a positive benefit is possible, but the benefit by an intensive management is ± 50.000 Dutch guilders higher being the same as the cost of one birdstrike.

Fig.2: GRASS GROWTH IN RELATION TO FERTILIZATION



ADF61646

The practical use of bird migration warnings

(some proposals for better cooperation between countries)

L.S. BUURMA

Royal Netherlands Air Force

introduction

Next autumn the RNLAF will start experiments with an electronic counting system on a full operational radarstation in the north of the Netherlands. This means a big step forward after more than two years of more or less improvisational detection of bird migration with the help of polaroid photos taken from the screen of a small airport radar with several technical failures. Parallel to the introduction of this new system, called KIEVIT*, we think the time is right to discuss again the practical use of the measurements, the way of dissemination of messages, and especially, how to cooperate with other countries in the future.
We feel an even stronger urgency for this after long discussions with fighter pilots. Many of them are not convinced the system works in a proper way because of several regular occuring distinct discrepancies between birdtams from neighbouring countries. Pilots don't believe that birdmigration stops or starts just at the borders and I have to agree with them. Apart from this, different phraseology, frequency of delivery of messages and the wide variety in flight restrictions, can easily result in different interpretations or even opposite actions by different airforces in the same area.
It is not my intention to bring in discussion flight restrictions, because they depend on many other operational considerations and therefore, they should be discussed within the Airforces Flight Safety Committee Europe. Further, I don't want to repeat the work already done within the communication working group concerning transmission networks and speeds. There are some more basic aspects of the birdtamsystem that raise problems to us. I want to focus your attention on the following questions that - we think - should be answered before the RNLAF embodies new procedures, especially when occasion arises due to the introduction of the new system.

* KIEVIT: The dutch name of the lapwing (Vanellus vanellus), but in this case the abbreviation of "kast met integrale electronische vogeltrek intensiteit tellers", what means: "box with integrated electronic birdmigration intensity counters".

questions

questions

1. Is it necessary that the information is to be given as rough as possible, or, do we have to provide interpretations? In the first case, we expect the pilot himself to combine the data and to draw the operational conclusions. On the other hand, we can produce such integrated data that the pilot has no escape possibility and can only choose whether or not to follow the appropriate rules. In case of the presence of a complete network of permanent stand-by long range suveillance radars with birddetection capability, the above mentioned possibilities come close together. But, as soon as different sources of migration (for example, field observations and radar data, or the combined use of different types of radar) are used, a difficult interpretation proces is necessary. In my opinion this can not be left to the users. In such cases it is better to formulate the outcome as simply and short as possible to avoid discussions on basis of partial information.

2. Is an international consultation before delivering high bird migration intensities possible? A simple telephone procedure, at least between neighbouring countries/stations, could be an important help to avoid contradictory warnings.

3. To avoid unwanted private interpretations one could include only the really relevant data for the pilots in the "ad hoc" birdtam, and leave out such details as bird species, flight directions and speeds. For direct operational use the last mentioned data are of low value, and in practice, they are also only partly known. For educational purposes one could perhaps defend the inclusion of the extra biological information. But, as far as I know, these data are not really measured "ad hoc". Generally speaking, they are taken from the average knowledge of ornithologists. Therefore, they can better be collected in a handbook with a fixed new page for every week or fortnight. Eventually, they also can be distributed by teleprinter, as is done in Germany.

4. Much confusion has been created by the differencies in the use of geographical indications. Some small countries simply declare the validity applicable to their whole territory. Larger countries either use "georefs" or mention only the station without indications for a certain area.

the actual situation

To illustrate the actual situation "an average example" of the actually used messages in Western Europe (as received by teleprinter in the Netherlands) is brought together in the appendix.

The clearest thing is that item d, f and g of the format, as described in the AIP are not filled in. Only some irregular messages appear with data about species, flight direction and speeds.

When the technical registration possiblities are present, height information is available.

Most countries deliver messages in case of intensities above a certain value. It is not always clear what happens when there is no message: no news, good news?

The geographical indications of Germany ("georefs") are always connected with one intensity, so, if some are indicated 7, there is no information on the remaining georefs, except that they are less than 7. Belgium, on the other hand, gives two regions and mentions for both the intensity of birdmigration.

proposals

1. In "ad hoc" warnings, as a rule, only data should be given that are measured also ad hoc.

2. General information on species to expect in a certain period, weather conditions that stimulate their movements, and regions they pass, should be compiled into a handbook.

3. If height information is available as a rule the level below which 90 percent of the birds fly should be indicated.

4. For better cooperation a choice should be made between the different ways of geographical description; the indications used by the different countries should be linked up.

5. If something is changed, a short description of birdtam issue procedures of the different countries should be distributed, including a list of station addresses and telephone numbers.

Norway

APPENDIX

nnnnzczc hya060
ff ehmryx
171025 ehmcyo
bird migration wng norway
a. maakeroey
b. radar
c. 17050830
d. xx
e. 6
f. moving north
g/h/i/j. xx

Denmark

nnnnzczc hya043
jj ekchyn egvcyo eggnyn edaayo edeeyo ednhyo ehmcyo ehzzne ehmryx
100700 ekmcyo
birdtam a/vordingborg 5501n 1155e b/radar c/100700z oct 77
d/xx e/8 f/xx g/xx h/xx i/xx j/xx

West Germany

nnnnzczc hya015
dd ebszyo ehzznh enfbyn eomiyo ehmryx ekmcyo
222026 eddzyo
msg nr 1918
c /038 notamn bremen/frankfurt fir nav warning.
birdmovement intensity 6/high up to 30000ft gnd
over kilo golf, lima golf,
kilo foxtrott 3+4, lima foxtrott 3+4
til 22042200.

Netherlands

nnnnzczc hya071
gg edzxyt edukyo ehmryx ehzznh ebbryr ebmiyo ebszzp lfzznh
190920 ehmcyo
bird migration warning netherlands nr 93
a. ypenburg 5200n0422e
b. radar
c. 19100910
d. xx
e. less than5
f/g/h. xx
i. valid ufn

Belgium

nnnnzczc hya079
dd egzmkk edzxyt ehmryx
211315 ebmiyo

birdwarning //44
a ebszzp
b radar
c 21041100z
d xx
e 8-land 2-coast
f ne
g xx
h 3000ft agl
i valid 2h

France

nnnnzczc hya038
ff lfpsyh lfzznh lfpjyrcd lfmmyo ehmryx
110/21 lfboyd
bird warning nr 36/bo
a/aerodrome de toulouse blagnac
b/radar
c/11/10/0/00tu
d/inconnu
e/forte - plus de 40 formations visibles simultanement
f/ssw
g/30kts
h/...

ADC(16M)

Working Paper

for

Presentation at the 13th BSCE Bern

Bird Strike Tests With Radomes And Windscreens Of The HFB 320 Hansa Jet And Transall C 160

Presented by

H. Kuckuck

Messerschmitt-Bölkow-Blohm GMBH
Unternehmensbereich Hamburger Flugzeugbau

346

Table of Contents

1. Introduction

This report contains a summary of bird strike tests which have been carried out on different aircraft types in accordance with requirements as per CAR 46 (AIR 2051/4.52) in the period between 1962 and 1970.
All tests which are described below have been carried out using a bird of 1.844 kg (4 lbs) shot from a compressed-air gun whereby it was possible to reach an impact velocity of between 478 km/h and 612 km/h.
A detailed report will be available on request after the 13th BSCE meeting.

2. Summary of tests carried out on components of different types of aircraft

2.1 Basic tests carried out on a special measuring nose with glass dome.

The weight of the projectile amounted to W = 2,14 kg, and the impact velocity was v = 400 km/h.
The measuring nose consisted of GRP, and was equipped in front with a dome-shaped glass pane of 10 mm thickness.

The glass dome was detached from the GRP nose under the impact of the bird, and destroyed.
Approximately 30 % of the resulting fragments were lying on the ground in front of the nose section after the shot.

2.2 Aircraft type HFB 320 Hansa Jet

2.2.1 Bird strike test on radome (GRP).

The weight of the projectile amounted to W = 1,79 kg, and the impact velocity was v = 612 km/h.
The projectile cut through the radome thereby causing the GRP mats to tear radially from the center which resulted in long fragments. One of the latch fittings was torn off as a result.
It can be assumed with certainty that the radome would have come off, endangering the engines and/or the tail unit.

2.2.2 Determination of resistance to bird strike of front windows.

Several shots were fired with an impact velocity of between v = 478 km/h and v = 590 km/h.

The weight of the projectile was 1,8 kg.
After several shots had been fired, the window panes cracked that is they were pierced in part.
This led to fragmentation.

2.3 **Aircraft type Transall C 160**

2.3.1 Basic testing of frames and 2 window panes.

The average impact velocity was v = 500 km/h.

The weight of the projectile was W = 1,8 kg.
Both window panes were pierced and the frames deformed, or they broke.
The following is the description of a test series for the optimization of window pane construction and window pane materials for the Transall C 160.

2.3.2 Test subsequent to para. 2.3.1

Front windows. Material: silica glass.
Several shots were fired with impact velocities ranging from v = 470 km/h to 550 km/h.

The weight of the projectile was W = 1,8 kg.
After a number of shots, the window panes lost their transparency, or broke whereby a large amount of splinters was hurled into the flight compartment mock-up.

2.3.3 Test subsequent to paras. 2.3.1 and 2.3.2

Front windows; Material: silica glass
stretched acrylic.
Several shots were fired with impact velocities ranging from v = 480 km/h to v = 520 km/h.

The weight of the projectile was W = 1,8 kg.
The transparency of the panes had disappeared to some extent after several shots. The panes splintered and were pierced in part whereby the projectile "hurt" or "killed" the dummy of a pilot.

2.3.4 Test subsequent to paras. 2.3.1, 2.3.2 and 2.3.3

Front windows (artificially aged by means of temperature shocks).
Materials: toughened glass
stretched acrylic.
Several shots were fired with an impact velocity of v = 490 km/h (± 5 % permissible tolerance).
The weight of the projectile was W = 1,8 kg.
All window panes suffered damage and/or were pierced in part as a result of which a great amount of tiny splinters was hurled inside the flight compartment which caused "severe injuries" to the dummy pilot.

2.3.5 Final test on front windows Transall C 160

Comparative test with panes made of different materials.

Materials: toughened glass
stretched acrylic.
Combination of toughened glass and stretched acrylic.

2.3.6 Bird strike test on radome Transall C 160

The measured impact velocity was v = 510 km/h.

The weight of the projectile was V = 1,8 kg.
The radome was pierced by the projectile without resulting fragmentation.
The only effect was that the paint started to flake in several places on the radome.

3. Results

As a result of the tests described above, the following modifications have been incorporated in the design stage (HFB 320; C 160):

- change of materials
- new design of window panes
- new design of window frames
- general reinforcement of the structure.

In particular, measures have been taken to prevent the effects of fragmentation by applying a plastic coat on the inside of the window panes.

354

4. Conclusion

The following paragraphs are concerned with the future participation of MBB in the work group "Structural Testing" and/or the BSCE.
On account of stricter airworthiness requirements (FAR 25.631, Amdt. 23) calling for safety measures to exclude damage to the tail unit even if the aircraft is hit by an 8 lb - bird, new bird strike tests may become necessary in the course of development of further civil aircraft projects.
Experiences gained in the process (as well as other information of a more general character) should be, with regard to the further development of European regulations (JAR) in particular, summarized in an "Advisory Circular Joint" (ACJ) and incorporated in the existing book of regulations.

Kuckuck
(Kuckuck)

Hamburg, d. 22.05.1978

AOF616148

AVIONS MARCEL DASSAULT - BREGUET AVIATION

EXPLOITATION DES TIRS D'OISEAUX A GRANDE VITESSE

SUR STRUCTURE D'AVIONS METALLIQUES

MERIGNAC, LE 12 MAI 1978

356

AVIONS MARCEL DASSAULT - BREGUET AVIATION

JB/YC-DTM-6103/78

Mérignac, le 2 Mai 1978

EXPLOITATION DES TIRS D'OISEAUX A GRANDE VITESSE

SUR STRUCTURE D'AVIONS METALLIQUES

1. AVANT PROPOS

Actuellement le constructeur d'avions confronté au problème d'impact d'oiseaux sur la structure a la choix entre deux attitudes.

Ou bien il ne peut admettre de destruction (admettant à la rigueur des déformations mineures)

Ou bien il admet des destructions, mêmes importantes, mais il doit en revanche démontrer qu'elles ne sont pas critiques c'est-à-dire que l'avion les subissant pourrait continuer son vol et atterrir sans danger.

Ceci conduit, pour étayer ce choix, à connaître des critères qui permettent de prévoir si sous l'impact il y a destruction ou non, et s'il y a destruction, quelle est l'étendue de celle-ci.

Les Avions Marcel Dassault - Bréguet Aviation, dans l'optique de la Certification d'avions civils, ont conduit une recherche de ce critère par l'analyse des résultats expérimentaux de tirs d'oiseaux au C E A T, en utilisant quelques résultats élémentaires de mécanique rationnelle et de théorie des structures et en faisant quelques hypothèses suggérées par l'observation du comportement de l'oiseau pendant les tirs.

.../...

2. RESULTATS EXPERIMENTAUX UTILISES

Nous avons analysé les résultats des tirs sur :

Mirage F1 : Oiseaux de masses diverses (0,5 à 1 kg) dans la manche d'entrée d'air (1969-1970) : 12 tirs.

Mercure : Eprouvette de définition de casquette de cabine vitrée (1971) 7 tirs d'oiseau de 4 lb.

: Eprouvette de casquette définitive (1973) 3 tirs d'oiseau de 4 lb .

Mystère 20: Eprouvette de casquette (1976) 1 tir d'oiseau de 4 lb.

: Bord d'attaque voilure externe (1976) 6 tirs d'oiseau de 4 lb.

Falcon 10 : Empennages (1974) 4 tirs d'oiseau de 4 lb
(1975-1976) 2 tirs d'oiseau de 8 lb.

Bords d'attaque au C E A T (1971 à 1976) 41 tirs d'oiseau de 4 lb.

Ces tirs ont été faits à l'aide du canon Ø 150 pour les oiseaux de 4 lb et en dessous et à l'aide du canon Ø 300 pour les oiseaux de 8 lb.

Les masses d'oiseaux tirées varient de 0,5 à 3,62 kg.

La planche 1 montre le schéma et les masses des emballages utilisées pour projeter l'oiseau.

Les vitesses de tir entrainant des destructions ont varié de 90 à 330 m/s.

3. HYPOTHESES DE CONDUITE DE L'ANALYSE

Vu l'écart des masses et des vitesses et pour n'avoir qu'un seul paramètre relatif au tir, nous avons considéré l'énergie cinétique de la masse tirée ou de l'oiseau seul suivant les cas.

Dans les essais considérés, cette énergie cinétique varie de 7000 à 60000 joules.

Pour analyser ces tirs nous avons fait les hypothèses simplificatives suivantes.

Hypothèse n°1

L'énergie cinétique de l'oiseau et de son enveloppe est uniformément répartie sur la surface du cercle ayant pour diamètre soit le diamètre du canon (oiseau de 4 lb) soit le diamètre du logement de l'oiseau dans le projectile (oiseau de 8 lb). C'est-à-dire que nous avons un flux d'énergie cinétique constant à la sortie du canon.

Hypothèse n°2

Les destructions observées (effets mécaniques du choc) sont dûes à la composante normale de l'énergie tombant sur la surface considérée.

Enfin, pour étendre les résultats de l'analyse, des structures essayées au C E A T, à l'avion lui-même en vol, nous faisonsla 3ème hypothèse.

Hypothèse n°3

Les tirs du C E A T sont représentatifs de la réalité en vol.
Cette dernière hypothèse est liée en fait à la première et met en question le niveau du flux d'énergie cinétique auquel sont soumises les structures.

Nous pensons, par l'exemple d'un impact d'un gros oiseau (>4lb) à 450 kt vrai sur un bord d'attaque de MYSTERE 20, que les flux du C E A T sont forts et peut-être défavorables ; mais n'ayant pas d'éléments pour traiter cette question de niveau, nous ne reparlerons pas de ce problème qui reste à résoudre.

En revenant sur la première hypothèse de la constance de la répartition du flux d'énergie cinétique, nous dirons seulement qu'elle n'implique pas l'indépendance des énergies locales tombant sur la surface impactée.

On peut seulement dire, en observant le comportement de l'oiseau dans l'impact, que :

a) si la matière de l'oiseau va dans toutes les directions, l'oiseau se comporte comme un fluide libre et on peut parler d'indépendance des énergies locales et en tirer les conséquences pour l'évaluation de l'énergie tombant sur une partie de la structure.

b) si à l'impact la matière de l'oiseau ne peut revenir en arrière, on doit considérer qu'elle se partage suivant des plans parallèles à l'axe du canon et l'énergie cinétique correspondant à ce partage affecte successivement les parties de structure balayées dans le sens du mouvement de l'oiseau.

La définition des plans de partage dépend de la structure elle-même.

Sur une structure maillée ces plans seront ceux des éléments parallèles au plan contenant l'axe du canon et la normale à la surface au point d'impact de l'axe du canon. (voir pl .2)

Sur un dièdre et un bord d'attaque le plan de séparation de la matière de l'oiseau sera celui contenant le bord d'attaque et l'axe du canon.

L'hypothèse n°2 a été suggérée par le fait que dans les destructions observées, la matière de l'oiseau était rentrée à l'intérieur des structures, restant parfois collée sur les éléments ayant cédé ; d'où la considération d'énergie normale.

Cette hypothèse permet, de plus, d'utiliser les résultats de la mécanique rationnelle sur les percussions et la théorie classique des structures.
Elle suppose aussi qu'il n'y a pas frottement, l'énergie tangente étant simplement évacuée.

Ce qu'il faut voir c'est que l'utilisation du concept d'énergie cinétique normale reçue, permet, à partir de considérations géométriques simples, de relier entre eux des résultats de tirs où il n'y avait pas de mesures d'effort ou bien où on ne pouvait valablement les exploiter.

Cependant il faut dire aussi que nous n'avons jamais pu évaluer, par la structure elle-même l'énergie de destruction mise en jeu et la comparer à l'énergie reçue évaluée par les considérations géométriques.

3. DEVELOPPEMENT DE L'ANALYSE

En utilisant les hypothèses énoncées ci-dessus les essais faits se sont classés d'abord : en trois catégories.

Les tirs rasants sur surfaces convexes (casquettes)

Les tirs rasants sur surfaces concaves (manche à air)

Les tirs sur bords d'attaque

Ces derniers ont été mis à part dès le début par la difficulté de faire une évaluation analytique correcte de l'énergie normale reçue.

Les tirs rasants sur surfaces concaves donnaient sur structure identique des énergies de destructions beaucoup plus faibles que sur surfaces convexes ; aussi avons-nous cherché à les relier en utilisant le concept de force moyenne à l'impact.

Nous avons ainsi obtenu une relation unique entre l'énergie normale et l'épaisseur.

Les bords d'attaque ont été traités différemment et nous avons dû introduire la notion d'énergie cinétique captée.

Cette énergie se définit comme l'énergie cinétique de la matière de l'oiseau qui est restée, après l'impact,dans la partie détruite du bord d'attaque.

Elle est la différence entre l'énergie cinétique de l'oiseau à la sortie du canon et l'énergie de la matière trouvée hors du bord d'attaque.

Nous devons dire tout de suite que nous avons évalué directement à partir des observations géométriques faites cette énergie captée.

L'analyse sur les bords d'attaque a conduit, pour une matière donnée (AU 4 G1), à un coefficient reliant l'énergie captée à la section détruite.

Enfin, nous avons repris l'analyse des essais de tir rasant sur les surfaces pour voir si elle ne recoupe pas les résultats sur les bords d'attaque.

4. RELATIONS MECANIQUES UTILISEES

Si α est l'angle de la normale à la surface, avec la direction du tir, et S l'aire du cercle sur lequel se répartit l'énergie, l'énergie cinétique reçue est :

$$W_N = \frac{1}{2}\ \frac{m\ V^2}{S} \iint_{\Omega} \cos^3\alpha\ \ d\omega$$

Ω étant le domaine d'intégration choisi suivant les considérations développées au sujet de l'hypothèse n°1.

Si on remplace la surface par son plan tangent on a une majorante de l'énergie normale reçue.

$$W_N = \frac{1}{2}\ \ m\ V^2.\ \mathrm{Cos}^2\ \overline{\alpha}$$

$\overline{\alpha}$ angle moyen

La force moyenne d'impact est définie par la relation $\frac{1}{2}\, m\ V^2 = F\ (L + \ell)$

L = longueur de destruction observée

ℓ = longueur caractéristique de destruction de l'oiseau ($\ell = \frac{\ell'}{2}$)

ℓ'= longueur de l'oiseau

le tout, énergie et longueurs, étant comptées dans le sens du mouvement.

On trouve aussi en considérant l'oiseau comme un fluide et en appliquant le théorème des quantités de mouvement dans un choc contre une surface concave assimilée à une calotte sphérique, l'effet de concentration d'énergie des surfaces concaves.

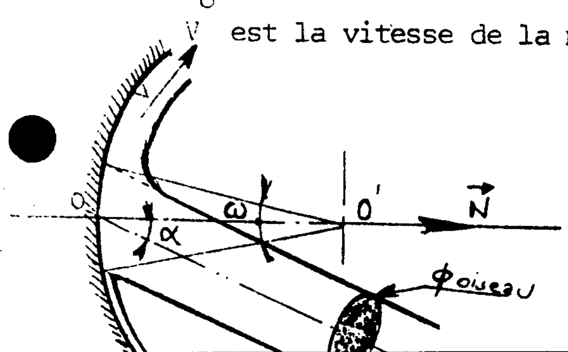
$$E_{apparente} = \frac{1}{2}\, m\ V^2_{\ o}\ \mathrm{Cos}^2\ \alpha\ \left(\frac{V \sin\omega}{V_o \cos\alpha} + 1\right)$$

où α est l'angle de la normale à la surface avec l'axe de tir.

ω est le demi-angle sous lequel on voit, depuis le centre de courbure de la surface, le diamètre du projectile placé sur la surface.

V_o est la vitesse à la sortie du canon

V est la vitesse de la matière s'échappant de la surface



dans les dépouillements, nous prenons :

$\frac{V}{V_o} = 1$ (pas de ralentissement de la matière de l'oiseau).

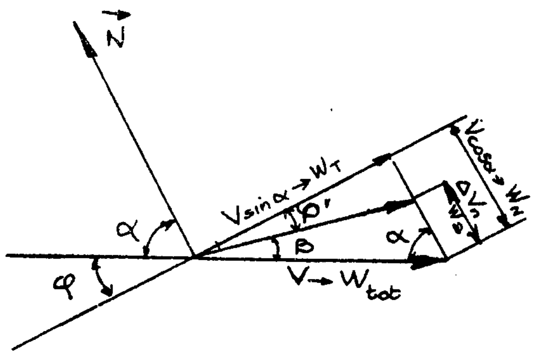
.../...

.../...

L'effet d'augmentation apparente d'énergie normale est donc :

$$\left(\frac{\sin \omega}{\cos \alpha} + 1\right)$$

Enfin nous signalons la déviation de la trajectoire de l'oiseau après le choc quand il y a eu absorption d'énergie normale.



En appliquant le théorème de Carnot sur la percussion des corps inélastiques, nous avons pour un tir rasant et en supposant l'énergie tangente conservée, avec les notations du schéma ci-contre.

pour incidence rasante :

$$\beta \simeq \sqrt{\frac{W_a}{W_{tot} - W_a}}$$

W_a énergie absorbée.

Pour une incidence de tir importante

$$\text{tg}\, \beta = \frac{\text{tg}\, \alpha \sqrt{\frac{W_a}{W_N}}}{1 + \text{tg}^2 \alpha - \sqrt{\frac{W_a}{W_N}}}$$

Cette déviation n'a été observée qu'une fois dans un tir sur radome et comme nous devons parfois considérer des impacts successifs, cette relation donnant les déviations de trajectoire est utile ; il faudrait donc la vérifier expérimentalement.

5. TIRS RASANTS SUR SURFACES

Toutes les structures dont nous avons analysé les tirs étaient en AU 4 G1.
C'étaient :

Surfaces convexes

- éprouvette cylindrique de définition de la casquette Mercure photo pl. 3
- casquette Mercure elle-même photo pl. 4
- casquette Mystère 20 photo pl. 5

Surfaces concaves

- éprouvette de manche à air de Mirage F1 photo pl. 6

Nous donnons pl.7 en fonction de l'épaisseur, l'énergie normale tombant au point d'impact sur le plan tangent à surface. Lors des tirs, l'énergie normale = $(0,5\ m\ V^2 \cos^2 \bar{\alpha} \times \frac{\Omega'}{S})$
est
évaluée conformément à l'hypothèse n°1 m étant la masse du projectile oiseau + emballage.

La figure supérieure donne les points des tirs sur l'éprouvette de définition de la casquette mercure, la casquette Mercure elle-même, la casquette du MY.20.

La figure inférieure donne les mêmes choses (énergie normale en fonction de l'épaisseur) pour la manche à air du F1. On voit que pour obtenir les destructions (points entourés d'un cercle) il faut beaucoup moins d'énergie que sur une surface convexe.

Cependant si on corrige l'énergie normale par le coefficient d'effet concentrateur calculé comme il est dit au paragraphe précédent, les points d'essais deviennent les triangles portés dans la figure supérieure.

Et l'on voit alors pour de la structure courante par exemple, que le plan est séparé par une droite au-dessus de laquelle les tirs amènent des destructions, au-dessous de laquelle la surface n'est pas perçée.

La droite a été choisie comme frontière en application du raisonnement suivant qui utilise la formule classique des contraintes dynamiques pour une poutre appuyée sur deux appuis distants de ℓ et de module d'inertie I/v :

$$\sigma = \sqrt{\frac{6\ W\ E\ v^2}{I\ell}}$$

Cette relation s'étend au cas d'une plaque longue dans le sens perpendiculaire à sa portée en faisant :

$$I = \frac{e^3}{12} \qquad v = \frac{e}{2} \quad \text{et} \quad \sigma = \sqrt{\frac{18\ W\ E}{\ell\ e}}$$

Si on choisit une contrainte de rupture σ_R négligeant le domaine plastique, on voit que l'énergie maximale avant destruction est :

$$\frac{W}{\ell e} = \frac{\sigma^2 R}{18E} = \text{constante}$$

L'énergie maximale varie comme la portée ℓ et l'épaisseur e.

D'où notre choix d'une droite pour séparer dans le plan les tirs bons et les tirs mauvais.

Dans le cas de structures courantes (points représentatifs notés par des points ou des triangles) nous avons hésité pour placer cette droite.

Ceci se traduit par la zone ombrée de la figure supérieure.

A la suite du tir sur la casquette MYSTERE 20 on peut proposer pour les tirs dans les mailles de structures courantes, structures constituées d'un revêtement mince (e < 4 mm) et de lisses et cadres en tôle pliée mince, la relation suivante pour l'énergie normale en-dessous de laquelle il n'y a pas destruction :

$$W_N = 1900\ e\ \frac{\ell}{136}$$

W_N énergie normale en joules

e épaisseur de la maille (mm)

$\frac{\ell}{136}$ est un coefficient de correction de maille avec ℓ (mm) plus petite dimension de la maille et 136 largeur des mailles sur l'éprouvette de référence.

Si on considère des impacts sur des mailles bordées par des membrures fortes (cadres usinés mécanique etc ..) les points repérés par des croix dans la figure supérieure conduisent à choisir une relation :

$$W_N = 3250\ e\ \frac{\ell}{136}$$

avec les mêmes notations que précédemment.

6. TIRS SUR LES BORDS D'ATTAQUE

6.1 Bords d'attaque du FALCON 10

6.10 Introduction

Les tirs que nous avons considéré tout d'abord ont été les tirs sur les empennages du FALCON 10 (Photo pl. 8) soit 4 tirs d'oiseaux de 4 lb et 2 tirs d'oiseaux de 8 lb à des vitesses de l'ordre de 180 m/s (350 kts). Les empennages étaient munis d'un appareillage extensométrique destiné à mesurer la force d'impact.

Disons tout de suite qu'il n'a pas été possible d'exploiter les mesures sur les 5 premiers tirs. Par contre, pour le dernier tir, où les empennages étaient montés sur une balance, nous avons pu avoir une valeur de la force d'impact.

Nous avons fait cependant les constatations suivantes :
Les destructions produites par l'oiseau restent locales. Les attaches d'empennages, dans les tirs en extrémité de plan où du fait des bras de levier on aurait pu craindre des destructions, ne souffrent pas.

Les dégâts commis par un oiseau de 8 lb ne sont pas plus graves que ceux d'un oiseau de 4 lb.

Enfin nous retrouvions, après les tirs d'oiseaux de 8 lb, sur le mur vertical derrière l'empennage deux taches de matière d'oiseau qui montraient à l'évidence que toute la masse de l'oiseau n'avait pas été prise par le bord d'attaque et que ce fait pouvait peut être expliquer la constatation précédente sur les dégâts.

6.11 Dépouillement des tirs de l'oiseau de 8 lb - Energie cinétique captée par le bord d'attaque

La géométrie et la position des taches nous a donné un moyen de déterminer la quantité de matière qui était allée sur le mur.
Le dessin planche 9 montre le phénomène observé et donne le schéma d'exploitation. On fait les hypothèses suivantes :

1) Le tir se faisant dans le plan des cordes de l'empennage horizontal qui a des profils symétriques, l'oiseau se découpe en tranches parallèles à ce plan.

2) Les points extrêmes des taches sur le mur proviennent des points extrêmes dans le canon de la matière non captée.

3) La matière de l'oiseau est répartie dans le cylindre qui est son logement dans le projectile.

Le diamètre de ce logement est :

Ø = 240 mm (tir n°5)

Ø = 160 mm (tir n°7 - 6ème tir)

L'examen des taches nous fait considérer deux choses :
L'écartement des taches nous indique une déviation de la matière de l'oiseau.
Les dimensions de chaque tache nous font considérer l'éclatement de l'oiseau que nous appelerons la décohésion.

Ces deux notions : déviation, décohésion sont caractérisées par des angles.
Ces deux angles nous permettent, moyennant deux autres hypothèses complémentaires de calculer la quantité de matière de l'oiseau qui a intéressé le bord d'attaque.
Les équations de définition sont données dans le tableau n°1 .

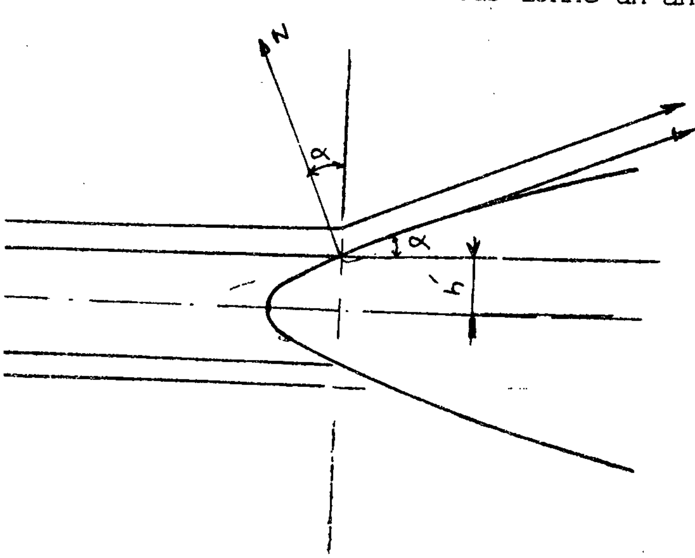
a) Utilisation de la décohésion

On fait l'hypothèse que pour chaque tache séparément la décohésion dans le plan vertical est la même que dans le plan horizontal. En écrivant de plus que les points B. A. B sont sur le même segment de cercle, nous obtenons, pour chaque tache, deux relations qui nous permettent de calculer la hauteur h' de matière captée et l'angle de décohésion δ.
Dans les calculs faits pour chacun des tirs séparément les dimensions des taches nous ont donné numériquement la même équation pour la décohésion.

Par contre, les équations étaient différentes du tir n°5 au tir n°7.

b) Utilisation de la déviation

La déviation nous donne un angle.



Et si, nous faisons l'hypothèse que la matière d'oiseau trouvée sur le mur a glissé avant décohésion sur le plan tangent, au profil ayant pour pente l'angle de déviation, nous obtenons directement sur le profil une valeur de la hauteur h' de la matière intéressant le bord d'attaque.

L'évaluation de la déviation s'effectue en considérant l'écartement des taches sur le mur et en tenant compte de l'angle de décohésion.

On évalue une déviation maximale donnée par les points A A' du schéma sur le mur une déviation minimale donnée par les points B, B'1.

La moyenne nous fournit la déviation et la hauteur h'.

Cette évaluation permet en outre de choisir la décohésion, car le fait d'écrire que les points extrêmes appartenaient au départ au contour d'un segment de cercle conduisait à deux solutions pour la hauteur de ce segment.

Le tableau n° 2 donne les données numériques, les valeurs des angles de déviation, de décohésion, les hauteurs de matière trouvées.

Si nous considérons les angles de déviation obtenus, l'énergie normale déviée est de l'ordre de 1,5 à 2,5% de l'énergie cinétique incidente.

Le tableau n° 2 donne les énergies captées par le bord d'attaque.

Si on admet l'angle de déviation 7° (qui donne les plus grandes hauteurs de matière) et que l'on applique cette méthode aux tirs de l'oiseau de 4 lb on obtient en énergie captée de l'oiseau + l'emballage, les valeurs ci-après :

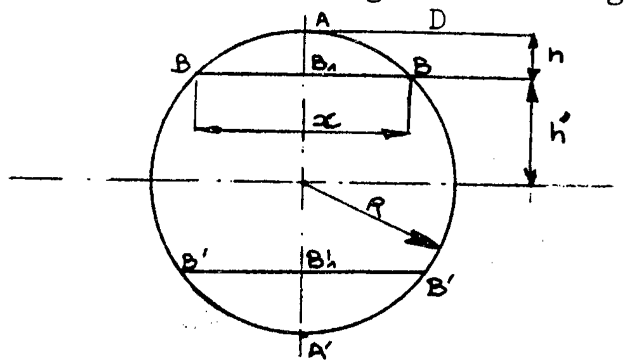
tir n° 2	20 652 joules
n° 4	14 044 joules
n° 3	9 164 joules

TABLEAU N° 1

EQUATIONS DE DEFINITION

1°) DECOHESION

$$(1)\quad \delta = \text{Arc tg} \frac{L - x}{D} = \text{Arc tg} \frac{H - h}{D}$$



$$(2)\quad (R - h)^2 + \frac{x^2}{4} = R^2$$

2°) DEVIATION

Déviation apparente maxi (points A A')

$$2\,\alpha'_{max} = \text{Arc tg} \frac{H_s + H_o + H_i - \Phi_o}{D}$$

Déviation maximale vraie :

$$2\,\alpha_{max} = 2\,\alpha'_{max} - \delta$$

Déviation minimale apparente (B_1 B'_1)

$$2\,\alpha'_{min} = \frac{H_o - h'}{D}$$

Déviation minimale vraie

$$2\,\alpha_{min} = 2\,\alpha'_{min} + \delta$$

TABLEAU N°2

	(en mm)	Tir n°5	Tir n°7
Hauteur tache supérieure	H_s	500	1530
Largeur tache supérieure	L_s	650	1600
Hauteur tache inférieure	H_i	1450	1570
Largeur tache inférieure	L_i	950	800
Diamètre oiseau	$\Phi_o=2R$	280	160
Distance entre taches	H_o	800	730
Distance du B.A au mur	D	7700	7630
Angle de décohésion	δ	4°,2	8°
Angle de déviation moyen	α	6°,9	9°,2
Hauteur de matière interceptée :			
Par décohésion	2h'	116	60
Par déviation	2h'	98	56,4
Vitesse oiseau (m/s)		176	196
Masse oiseau (kg)		3,6	3,1
Energie cinétique de l'oiseau(joules)		55756	59544
Energie d'oiseau captée			
Décohésion		28545	27748
Déviation		24329	26160

6.12 Evaluation de la force d'impact

Bien que cette force n'ait pas montré d'effets destructifs aux endroits où elle aurait dû être amplifiée (attaches d'empennage horizontal) nous avons tenté une évaluation par la relation donnée au paragraphe 4.

$$\frac{1}{2} m V^2 = F \left(L + \frac{\ell'}{2}\right)$$

ℓ' longueur de l'oiseau

L longueur des destructions dans le sens du tir (longueur d'arrêt de l'oiseau).

Cette évaluation qui avait pour but d'obtenir des valeurs de contraintes de destruction a surtout servi, par comparaison avec la pesée faite au tir n°7, à déterminer s'il fallait ou non compter l'emballage dans l'énergie reçue.

Pour ce tir la pesée nous a donné un effort horizontal de 2989 daN.
Le calcul de la force d'impact a donné les résultats suivants :

Par la décohésion oiseau seul	3384 daN
Par la déviation oiseau seul	3190 daN
Par la décohésion oiseau et emballage	3828 daN
Par la déviation oiseau + emballage	3608 daN

D'où le résultat le plus proche de la pesée est celui calculé à partir de l'oiseau seul et la déviation (3190 daN).
Le Tableau n°3 donne les forces d'impact évaluées dans les tirs n°3-4-5-7 où les dégâts ont été importants.

TABLEAU N° 3

Tir n°	Energie oiseau captée (joules)	Longueur oiseau ℓ' (m)	Longueur arrêt (m)	F_{daN}	$A_{(mm^2)}$	F/A daN/mm^2	W/A Joules/mm^2
3 (4lb)	9164	0,225	0,635	1220	1600	0,762	5,72
4 (4lb)	14044	0,225	0,465	2415	1180	2,05	11,90
5 (8lb)	24329 x(2/3) =16219	0,260	0,450	2796	1290	2,17	12,57
7 (8lb)	26160	0,32	0,660	3191	1522	2,096	17,19

Nota

Le coefficient 2/3 appliqué au calcul de l'énergie du tir n°5 correspond à la matière prise par la zone détruite : le long de l'envergure 1/3 de la masse captée est tombée sur une structure solide 2/3 sur de la structure courante seule ici considérée et identique à la structure en cause des tirs 4 et 7.

6.13 Contraintes de destruction - énergie de destruction

Le schéma des destructions sur l'empennage horizontal est donné pl.10 figure supérieure.

Les sections détruites semblent cisaillées.

Si nous comptons, l'aire de matière A détruite, comme indiqué à la planche 10 figure supérieure, en divisant la force d'impact par cette aire, on obtient les contraintes données dans l'avant dernière colonne du tableau n°3.

On s'aperçoit qu'elles ne sont pas les mêmes suivant le type de structure. Elles sont de 2,1 daN/mm^2 sur une structure de type caisson et de 0,8 daN/mm^2 sur la carène (tir n°3) qui est une structure plus légère.

Cette valeur de contrainte ne ressemble à rien de connu pour de l'AU 4 G1.

Si on considère l'énergie rapportée à cette section détruite, nous obtenons en moyenne 13,88 soit 14 Joules/mm^2 on est là encore loin de la résilience de l'AU 4 G1 : 0,1 joule/mm^2.

Si on admet que le tir n°3 sur carène est un résultat singulier on a recherché si on retrouvait cette valeur de 14 joules/mm^2 de section détruite sur les bords d'attaque de voilure du MYSTERE 20 et à la demande du STAé sur les tirs sur les bords d'attaque du CEAT.

6.2 Tirs sur bord d'attaque du MYSTERE 20

Six tirs d'oiseau de 4 lb ont été effectués en 1976 sur un bord d'attaque de voilure externe du MYSTERE 20.
Cette voilure est munie de becs basculants qui étaient en position rentrée.

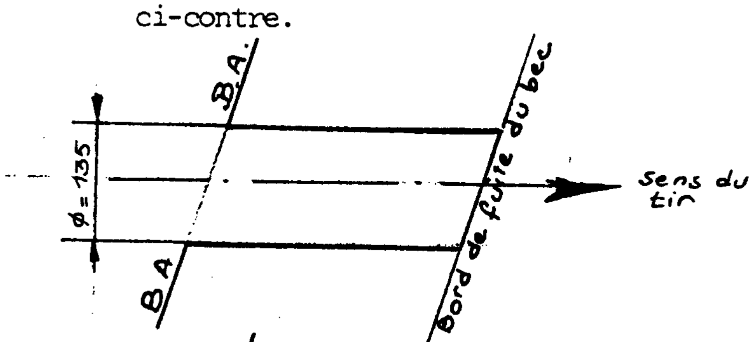
Le montage d'essai est donné par les photos N6 1856 et N6 1860 planche 11 .

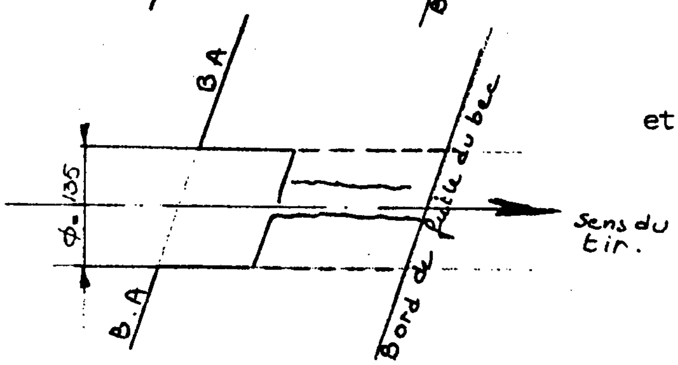
Seuls les tirs 1-2-3-6 sont valables. Dans les tirs 4 et 5 l'oiseau n'a pas touché le bord d'attaque.

Les destructions des tirs :

n° 6 et n° 3

ressemblent à celles de l'empennage du FALCON 10. On a sensiblement le schéma ci-contre.





Pour le tir n°1
et pour le tir n°2
on aurait plutôt le schéma ci-contre.

Cependant comme le montre le tir n°3 il semble que ce schéma de rupture ne soit pas fondamentalement différent de celui de l'empennage du FALCON 10 et nous avons compté la section détruite en supposant que, même dans ces deux cas, la destruction était semblable à celle de l'empennage du FALCON 10.
Le tableau n° 4 donne les sections détruites et l'énergie captée qui est ici toute l'énergie de l'oiseau.
On voit qu'en moyenne nous retrouvons 14,25 joules/mm^2 ce qui se rapproche de la valeur trouvée pour l'empennage horizontal du FALCON 10 (13,88 joules/mm^2).

MYSTERE 20 — TIPS SUR BORD D'ATTAQUE EXTERNE VOILURE

Tir n°		1	2	3	4	5 (tir en 4)	6
Distance à partir du fence le long du B.A. vers extrémité.		900	1730	3000	3960	3960	4500
Masse oiseau (kg)		1,84	1,98	1,95	1,84	(1,8 ?)	1,85
Vitesse (m/s)		180	178	196	220	205	233
Dégâts	Tôle extérieure e=2 + 0,8 (mm)	déchiré	déchiré	déchiré	déformé	Les dégâts n'ont pas été aggravés.	déchiré
	Tôle intérieure e=0,5 (mm)	déchiré	déchiré	déchiré	déformé		déchiré
	Longeron bec e=2 (mm)	cassé	cassé	déformé	intact		déchiré
	Tôle intrados bec e=1,6 (mm)	déchiré	déformé	déformé	intact		déchiré
	Tôle de bec fixe e=1,2 (mm)	déformé	déformé légèrement	déformé très légèrement	intact		déchiré
	Ame longeron avant aile e = 1,9 (mm)	intact	intact	intact	intact		cassé
Energie (joules)		29808	31367	37455	44528		50217
Surface détruite(cm^2) (2 x A/2)		33,80	20,40	19	Tir non valable	Tir non valable	38,82
Energie/cm^2		898	1537	1971			1293

6.3 Tirs sur les bords d'attaque du C E A T

Cette valeur de 14 joules/mm^2 de section détruite se retrouvant dans deux séries d'essais, le STAé nous a demandé d'analyser les essais faits sur les bords d'attaque du CEAT.

L'examen de la forme du bord d'attaque montre, par la considération du plan tangent à 7° que toute l'énergie cinétique de l'oiseau est prise par le bord d'attaque, sauf pour le rayon 20 mm (tirs 13 et 14) où 96% de l'énergie est captée.

Il semble d'autre part que la rupture commençante caractéristique soit donnée par les photos M3 1484 et M3 1485 (pl.12), ce qui nous a fait choisir comme section détruite l'intersection du cylindre oiseau avec le bord d'attaque voir schéma inférieur de la planche n° 10.

Les tirs où il y a eu destruction sont rassemblés dans le tableau suivant n° 5.

Dans ce tableau S_1 est la section du revêtement comme il est dit plus haut $S_1 + S_2$ la section du revêtement et du conduit de bord d'attaque.

Pour les 17 cas considérés la moyenne $\frac{W}{S_1}$ s'établit à 14,06 joules par mm^2 si on retire les 4 cas où il y a eu destruction du bord d'attaque (21 - 22 - 12 - 4D) dont la moyenne s'établit à $\frac{W}{S_1 + S_2}$ = 13,3 joules/mm^2

la moyenne des 12 cas s'établit à 12,5 joules/mm^2.

Donc l'énergie de destruction pour les becs du CEAT s'établierait vers 13 joules par mm^2.

Si on considère les limites de pénétration donnée sur la planche 3 du document CEAT, on obtient sur 11 cas la moyenne de $\frac{W}{S_1}$ = 10,5 joules/mm^2.

TABLEAU N° 5

Tir n°	Masse oiseau (kg)	V (m/s)	W(Joules)	S_1 (mm^2)	W/S_1	$S_1 + S_2$ (mm^2)	$W/(S_1 + S_2)$
20	1,9	93	8216	711	11,5		
21	1,86	140	18228	711	25,6	1159	15,7
18	1,9	90	7695	729	10,55		
22	1,95	163	25905	729	35,53	1977	13,1
7	1,89	103	10025	906	11,06		
Planche	1,8	127	14516	1132	12,82		
3	1,8	142	18148	1416	12,82		
CEAT	1,8	150	20250	1699	11,92		
14	1,82	126	13869	1277	10,86		
13	1,83	135	16008	1277	12,53		
5	1,875	100	9375	871	10,76		
9	1,82	111	11212	964	11,63		
12	1,89	149	20092	1191	16,87	1407	14,3
2(B)	1,78	86	6582	931	7,07		
1(A)	1,75	104	9464	931	10,2		
4(D)	1,83	120	13176	931	14,15	1309	10,06
24	1,96	110	11858	906	13,09		
Moyenne					14,06		13,3

6.4 Bords d'attaque du CEAT avec fendoirs

Nous avons deux tirs de bord d'attaque avec fendoir où le fendoir a été déchiré, le bord d'attaque étant détruit.

Tir n°	m (kg)	V (m/s)	W (joules)	S(détruite)	W/S
30	1,93	155	23184	1689	13,72
34	1,8	170	26010	1689	15,40
				moyenne	14,56

S détruite est égale à

section du bord d'attaque	453 mm^2
section du canal	128 mm^2
section du fendoir	1108 mm^2
Total	1689 mm^2

Donc les bords d'attaque avec fendoir se rapprochent des résultats FALCON 10 et MYSTERE 20.

6.5 Conclusion des analyses sur les bords d'attaque

Il semble donc que pour les bords d'attaque en AU 4 G1 en évaluant la section détruite comme indiqué sur la planche n°10, la valeur de 14 joules/mm^2 puisse donner la grandeur de l'énergie cinétique d'oiseau détruisant le bord d'attaque. Si on prend 10 joules par mm^2 on est sûr de ne pas avoir de pénétration.

7. RETOUR A LA CASQUETTE MERCURE

En rapprochant les empochements faits par l'oiseau dans la casquette Mercure (planches 13 - 14)
avec ceux dans les bords d'attaque du CEAT (voir pl.12) il est tentant d'évaluer l'énergie par unité de surface d'intersection du cylindre contenant l'oiseau avec la casquette.

En remplaçant la casquette par son plan tangent ceci revient à déterminer la longueur ℓ de l'ellipse d'intersection.

Nous evaluerons donc $\frac{W}{\ell e}$ (e épaisseur de casquette)

La relation de rupture donnée au paragraphe 5: $\frac{W}{e} = 1900$ nous donne :

$$\frac{W}{\ell e} = \frac{1900}{4\ R\ I_2 \cos\theta} = \frac{7,037}{I_2 \cos\theta}$$

avec R rayon de l'oiseau 67,5 mm
I_2 intégrale elliptique de 2° espèce
θ angle de la normale à la surface avec l'axe de tir

Les tirs sur la casquette Mercure ayant été faits avec des angles variant de 60 à 70° nous avons :

θ = 60° W/ℓe = 11,62 joules/mm^2
θ = 65° W/ℓe = 14,307 joules/mm^2
θ = 70° W/ℓe = 18,39 joules/mm^2

Ces valeurs sont à rapprocher de la valeur 14 joules par mm^2 obtenue pour les bords d'attaque.

Cependant on doit signaler que près d'une membrure forte il faudrait multiplier par $\frac{3250}{1900} = 1,71$

ce qui donnerait pour θ = 65° des valeurs de 24,5 joules/mm^2 rarement observées.

8. CONCLUSIONS

De nos investigations il semble que la considération de l'énergie cinétique de l'oiseau pendant l'impact

soit par sa valeur sur la normale à la surface dans les tirs rasants
soit par la notion d'énergie captée pour les bords d'attaque

fournit un critère qui nous permet de prévoir les destructions et par là même concevoir des structures qui tiendront l'impact.

Pour déterminer l'énergie captée il semble que l'on puisse prendre une masse d'oiseau définie par une hauteur correspondante à un plan tangent au profil incliné de 7° sur la direction du tir.

Ce résultat est à rapprocher de l'exigence de la FAR qui exclut du tir à l'oiseau les glaces inclinées à 15° sur la vitesse.

Les sections à considérer pour appliquer le critère (de 14 joules/mm^2 ou 10 joules/mm^2) sont l'intersection du cylindre oiseau ainsi défini avec la structure considérée.

Cependant pour que cette notion d'énergie soit plus fructueuse encore, il faudrait :

1°) Vérifier expérimentalement, sur plusieurs cas, la déviation de trajectoire prévue après franchissement d'une peau.

2°) Obtenir et analyser des destructions considérables en tirs rasants.

3°) Accumuler des résultats d'essais tant sur les alliages d'aluminium que sur d'autres matériaux (Titane, Aciers) pour préciser les chiffres donnés.

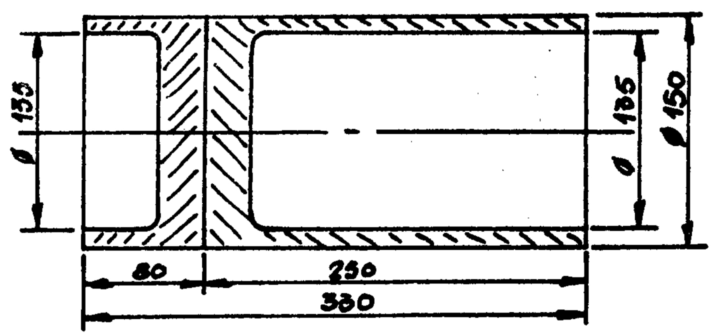
4°) Essayer de rattacher ces résultats à des propriétés usuellement connues des matériaux.

J. BESSE

P L A N C H E S

EMBALLAGES POUR TIRS D'OISEAUX

Emballage pour
canon Ø = 150 mm

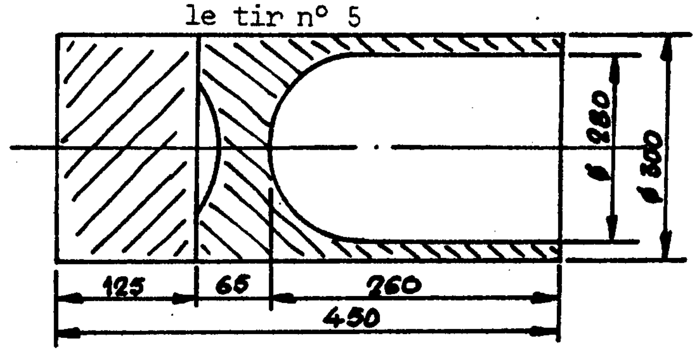


Masse emballage 180 g ± 15 g

Emballage pour
canon Ø = 300 mm

Masse emballage 850 g

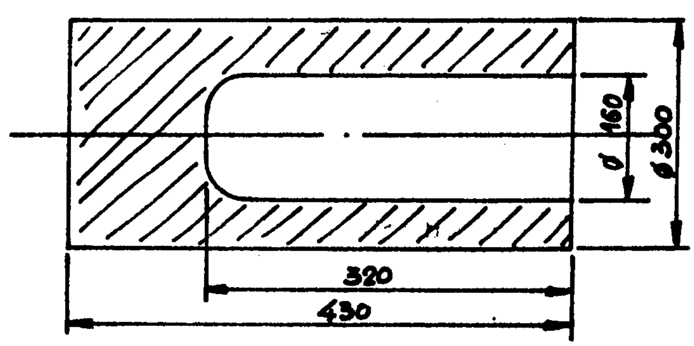
Emballage expérimental utilisé pour le tir n° 5



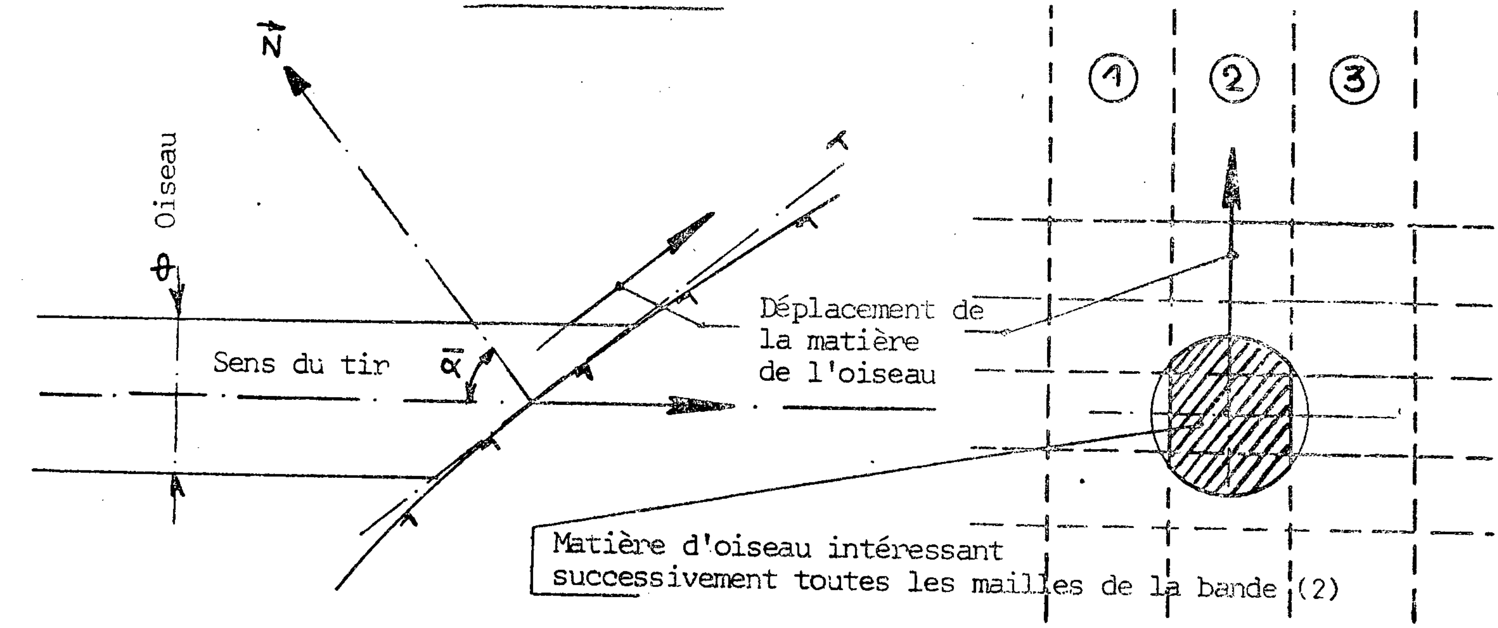
Emballage pour
canon Ø = 300 mm

Masse emballage 800 g

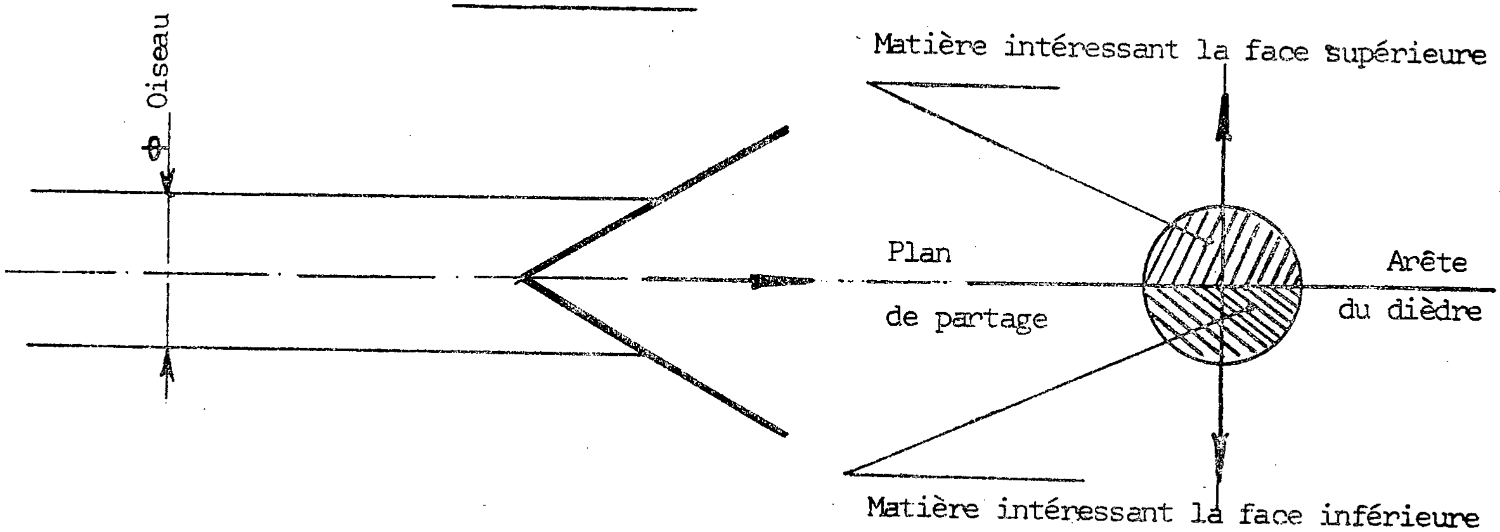
Emballage utilisé pour le tir n° 7



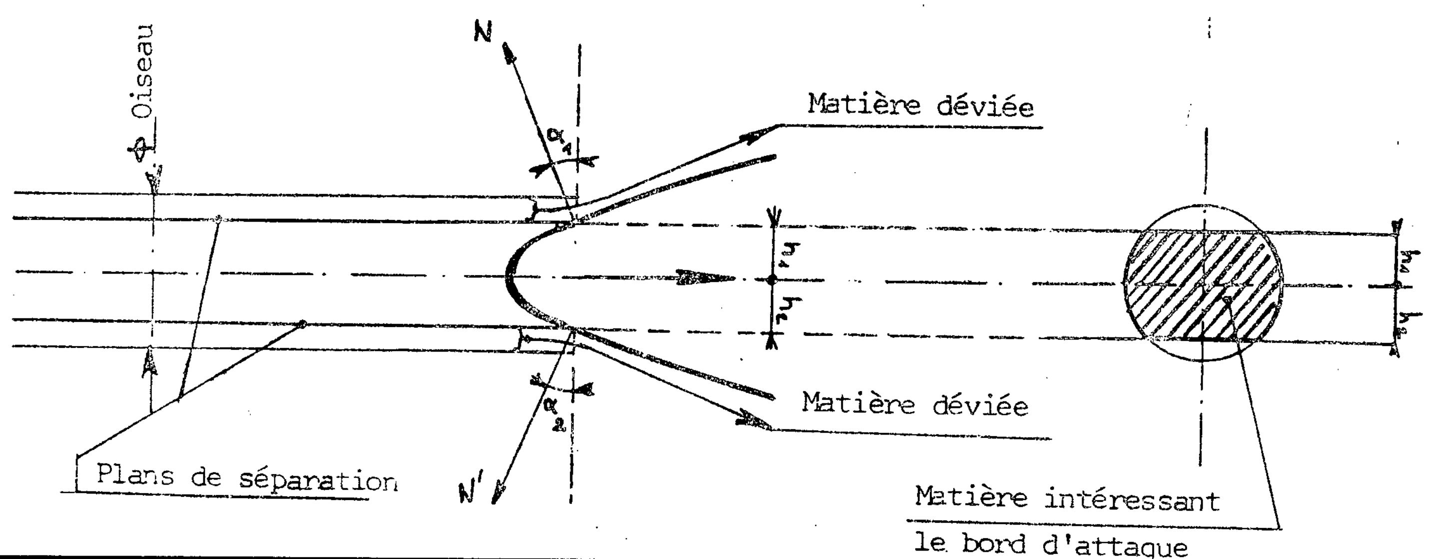
SURFACE MAILLEE



CAS D'UN DIEDRE

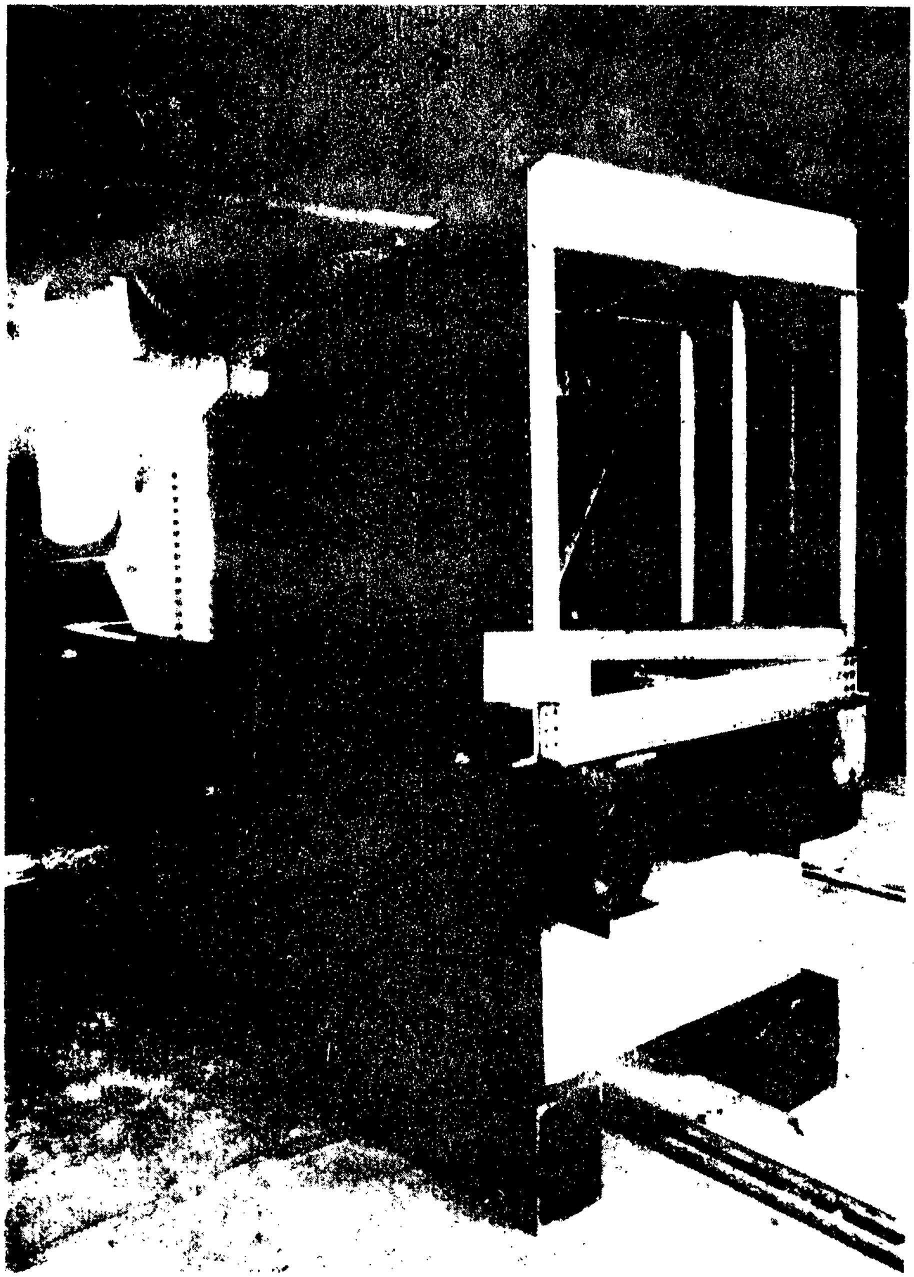


CAS D'UN BORD D'ATTAQUE

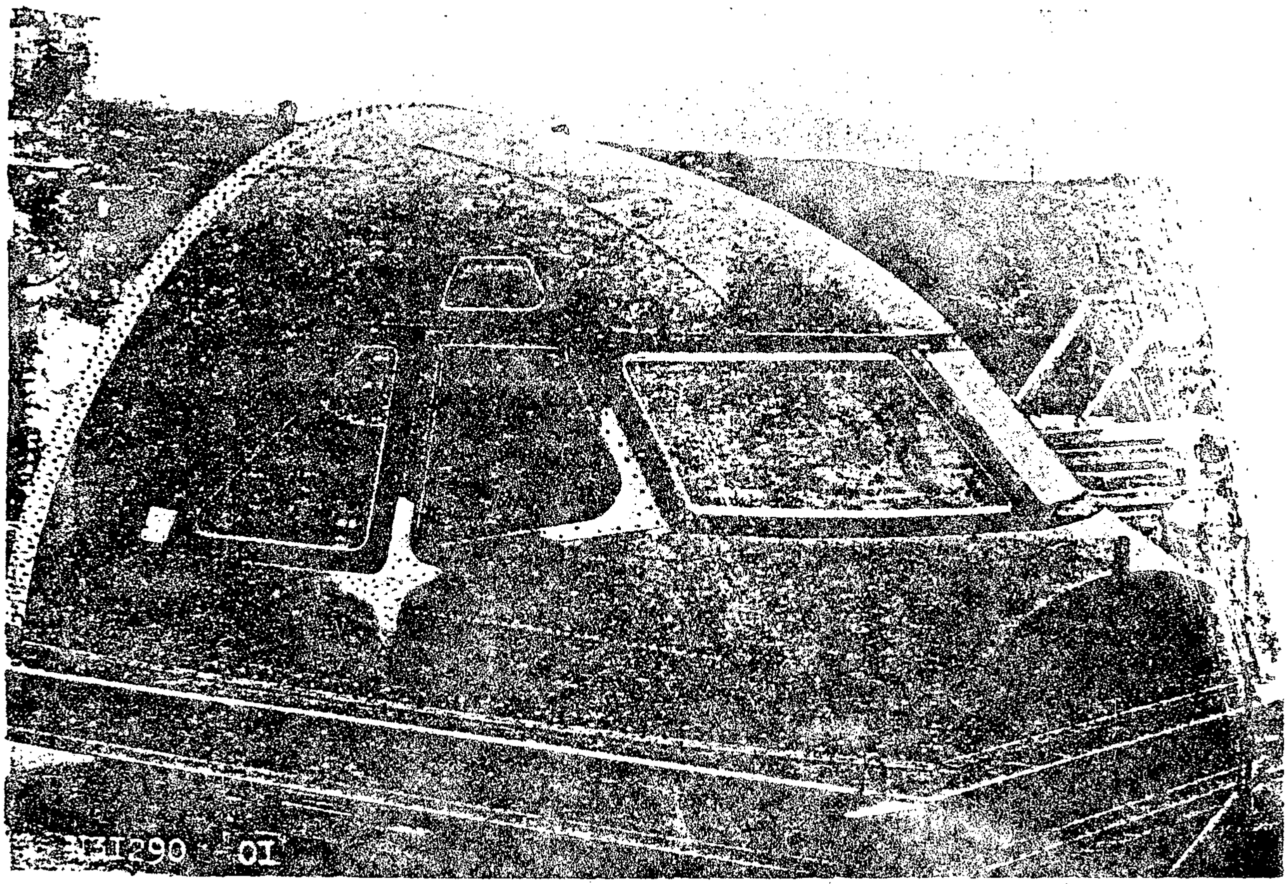


DTM-6103/78 **Planche 3**

ELEMENTS DE CASQUETTE MERCURE

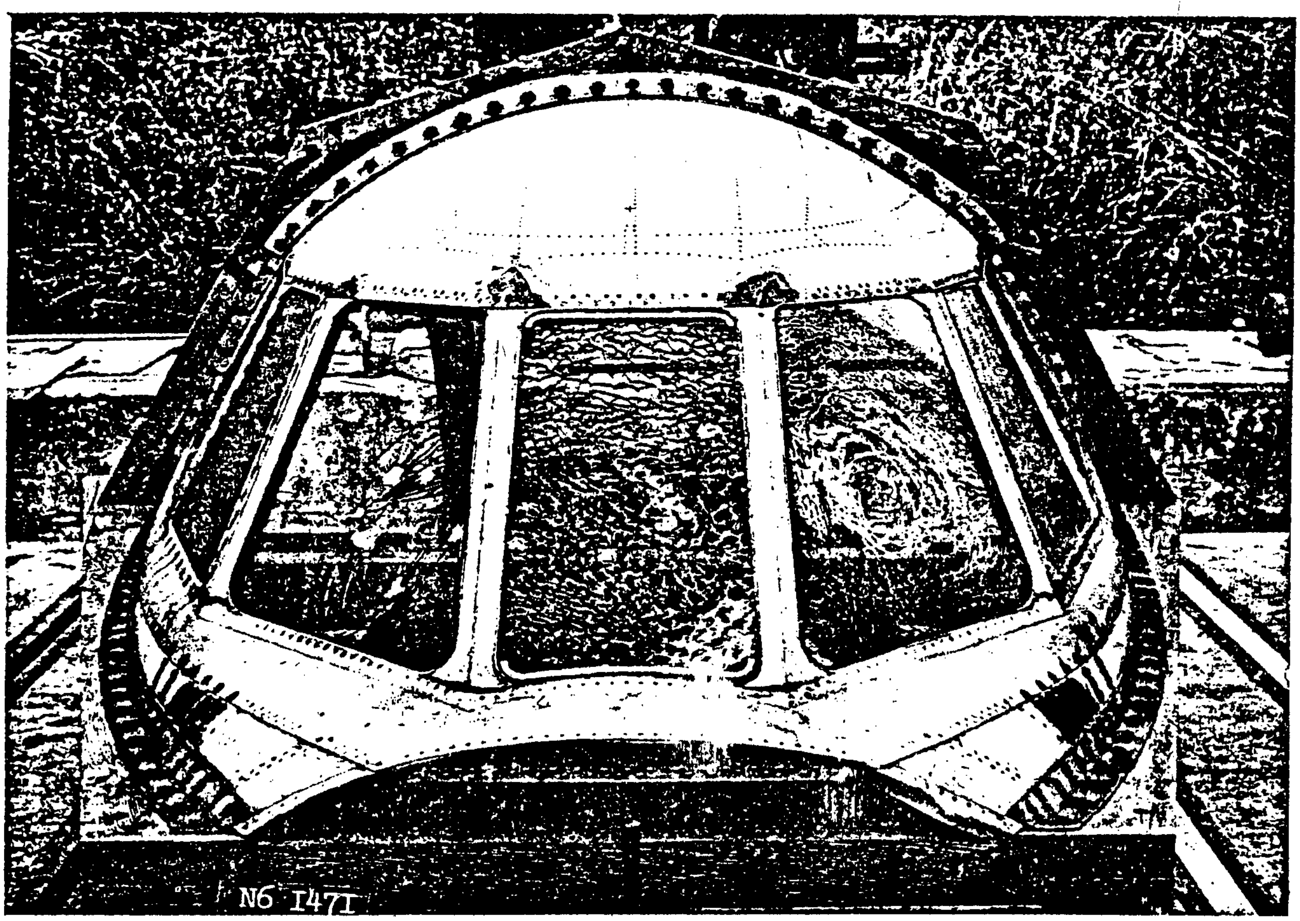


VUE D'ENSEMBLE DU MONTAGE D'ESSAI

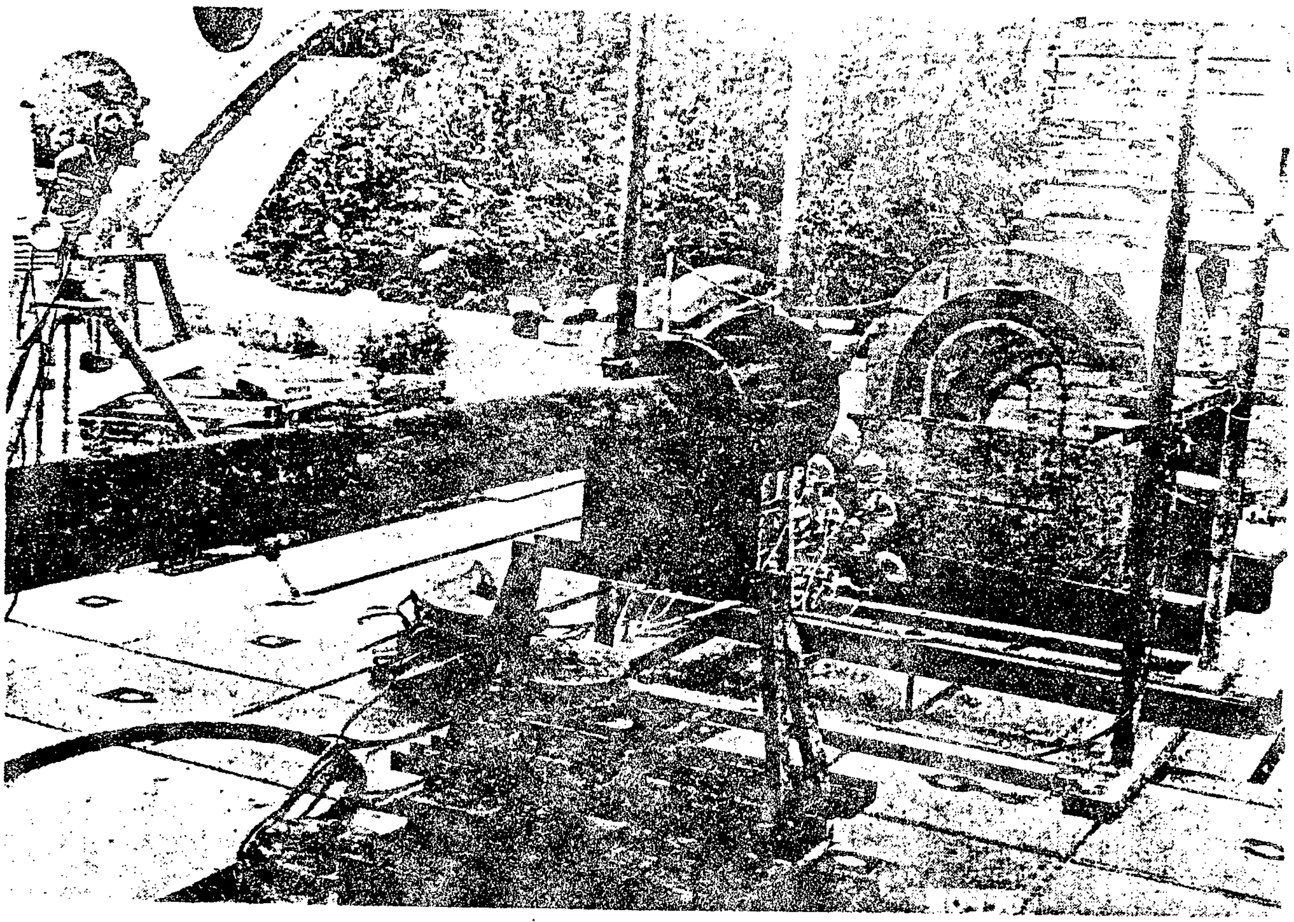


Verrière complète de l'av..n MERCURE

CABINE VITREE MYSTERE 20



DTM-6103/78 Planche 6

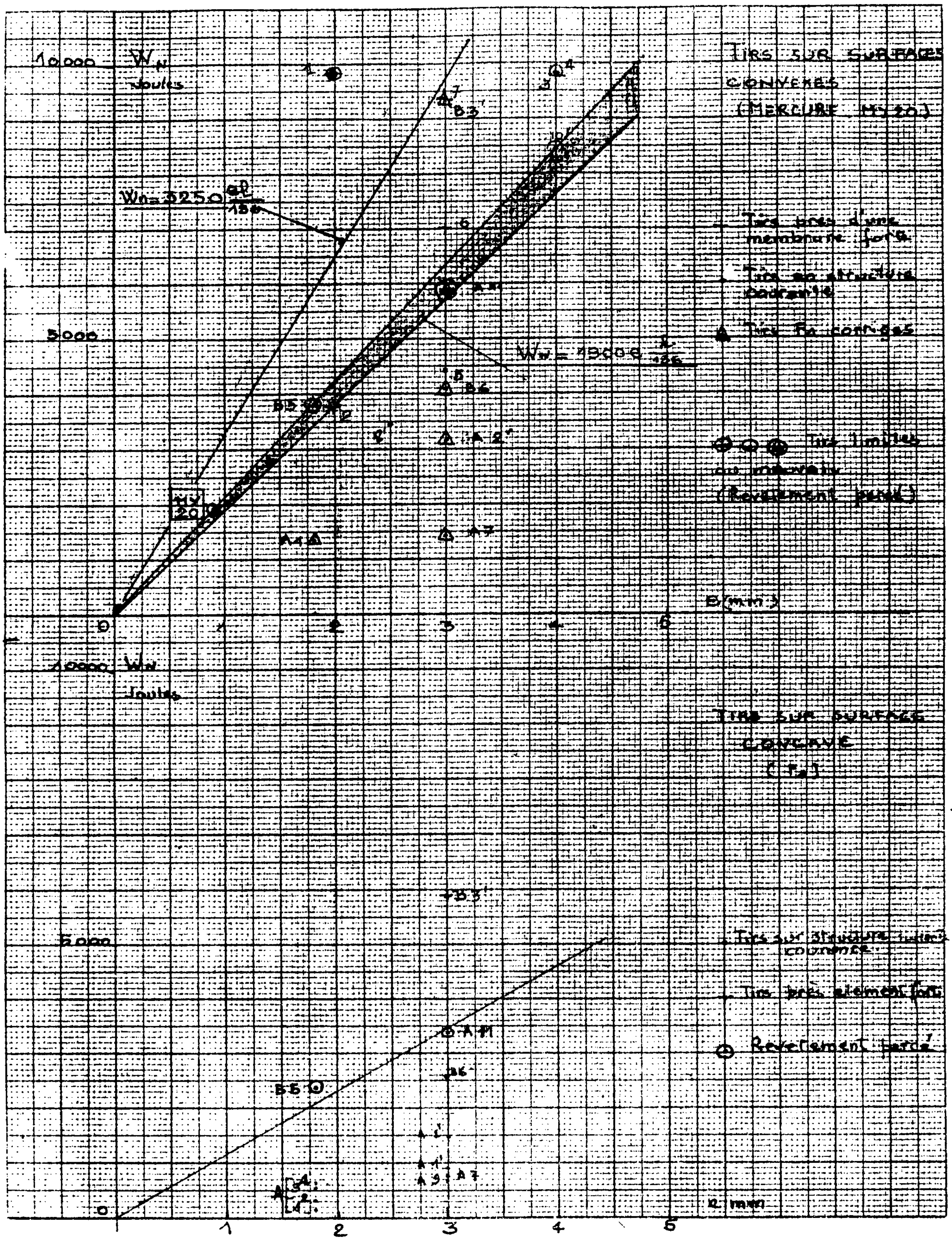


ENTREE D'AIR MIRAGE F 1

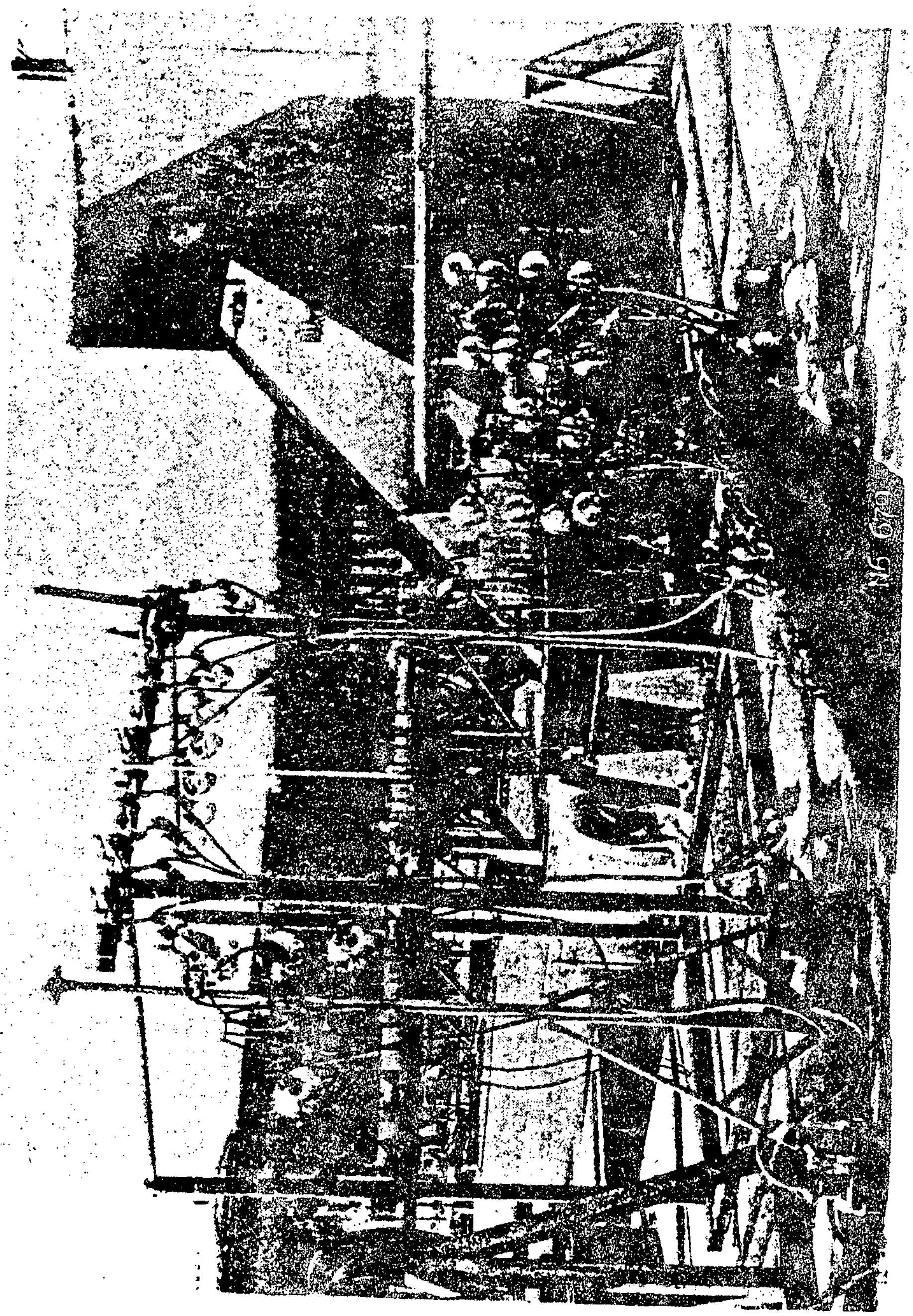
Montage d' essai

TIRS RASANTS SUR SURFACES

ENERGIE CINETIQUE NORMALE EN FONCTION DE L'EPAISSEUR DU REVETEMENT



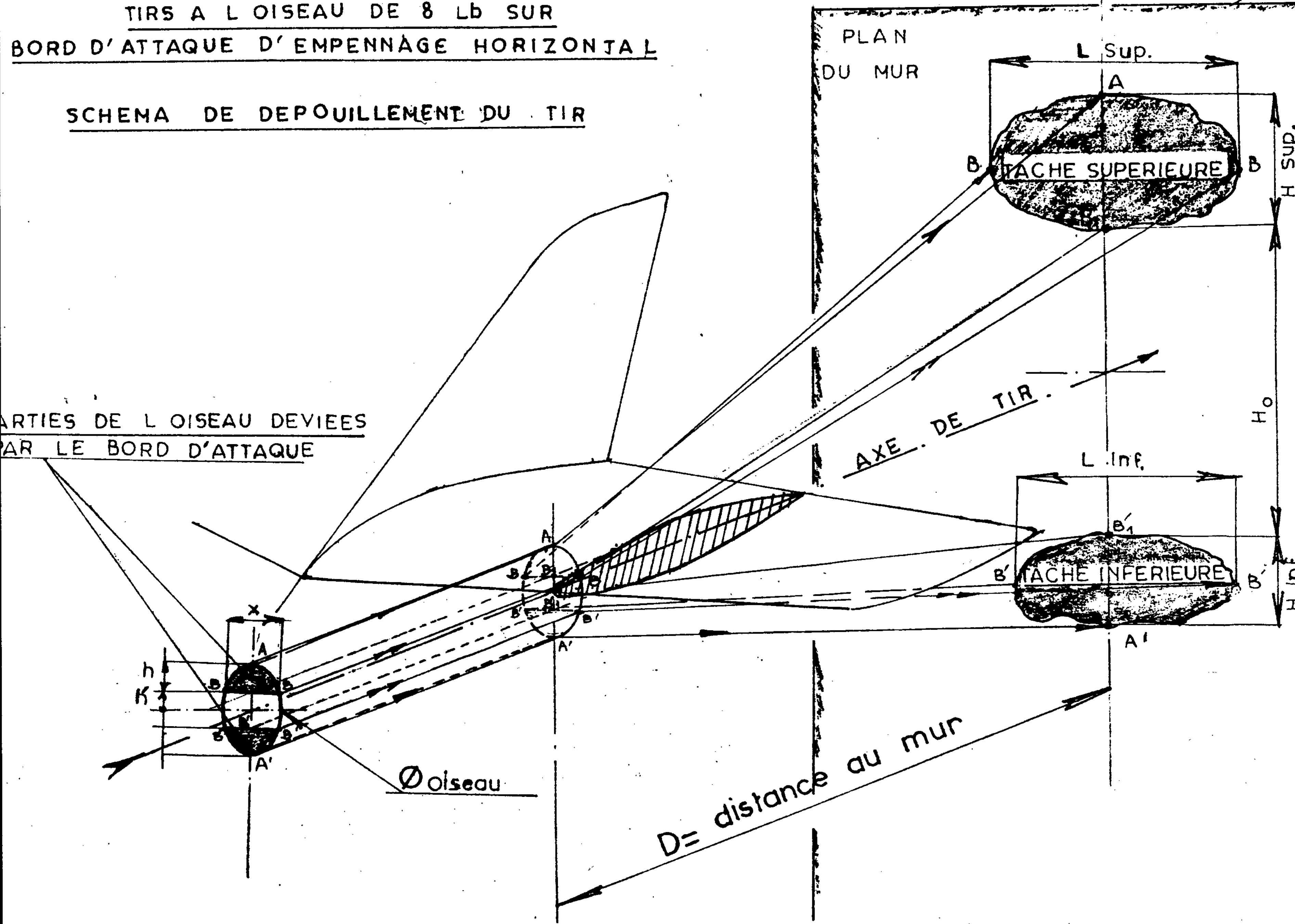
FALCON 10 Empennage complet



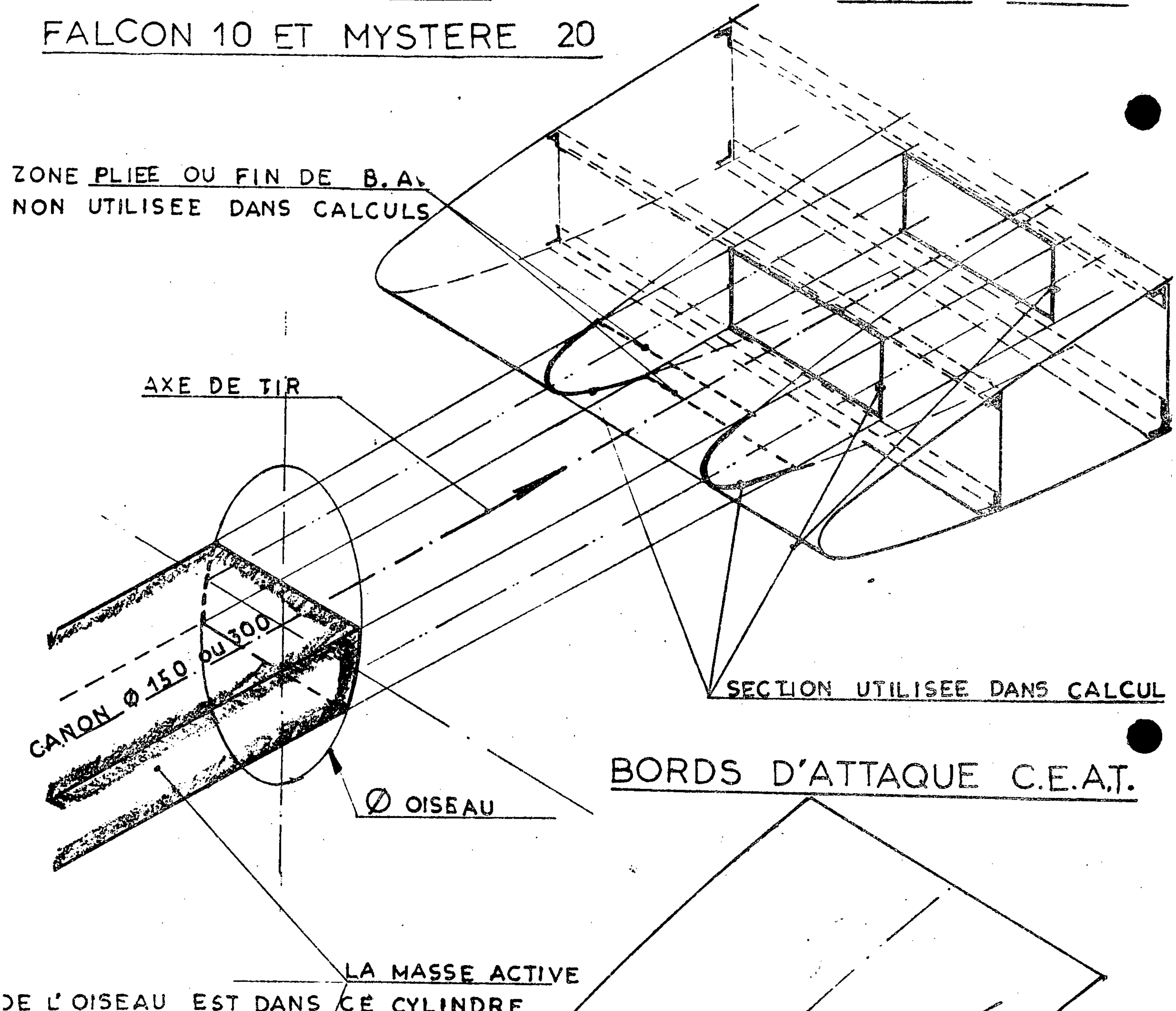
FALCON 10

TIRS A L OISEAU DE 8 Lb SUR BORD D'ATTAQUE D'EMPENNAGE HORIZONTAL

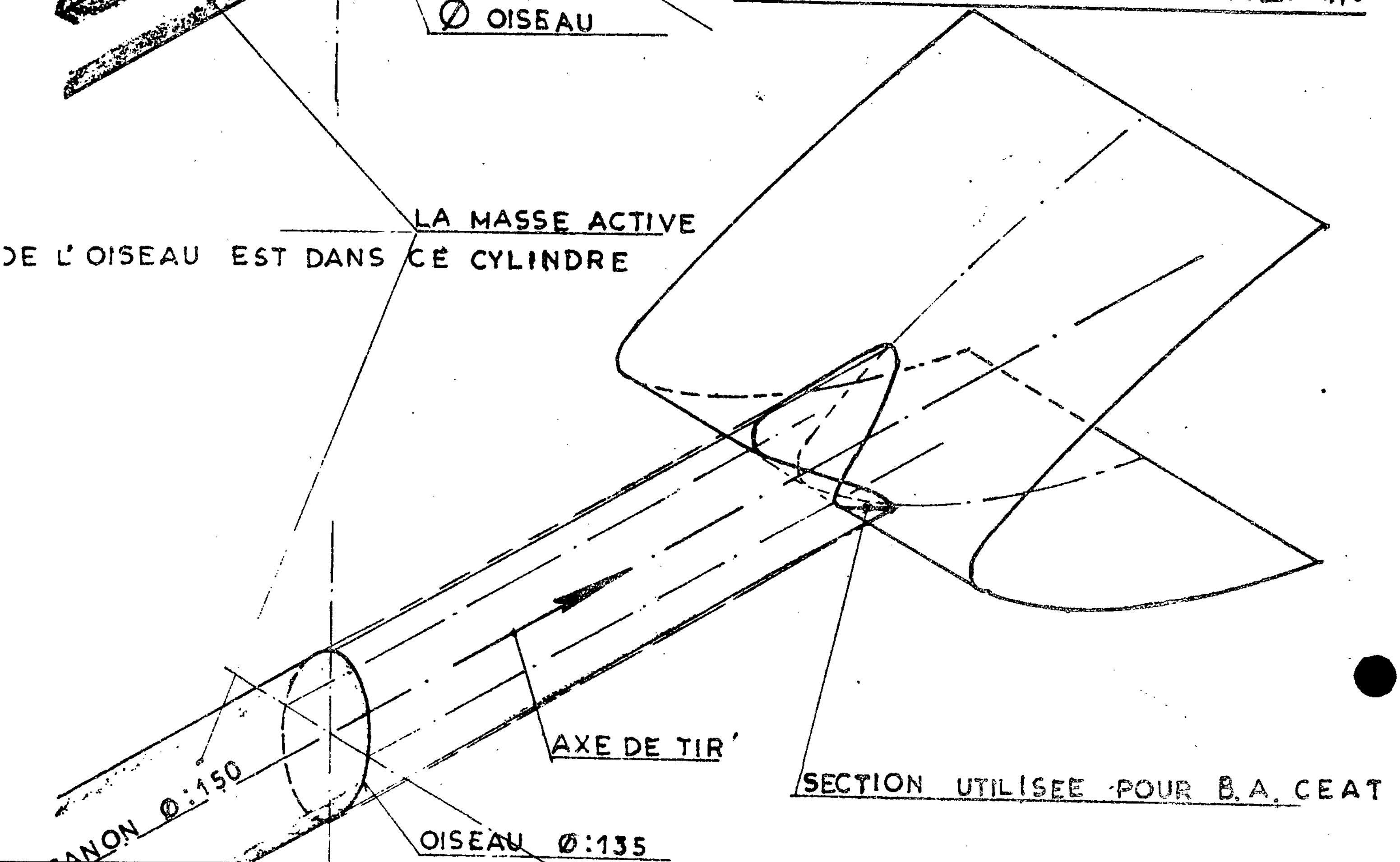
SCHEMA DE DEPOUILLEMENT DU TIR



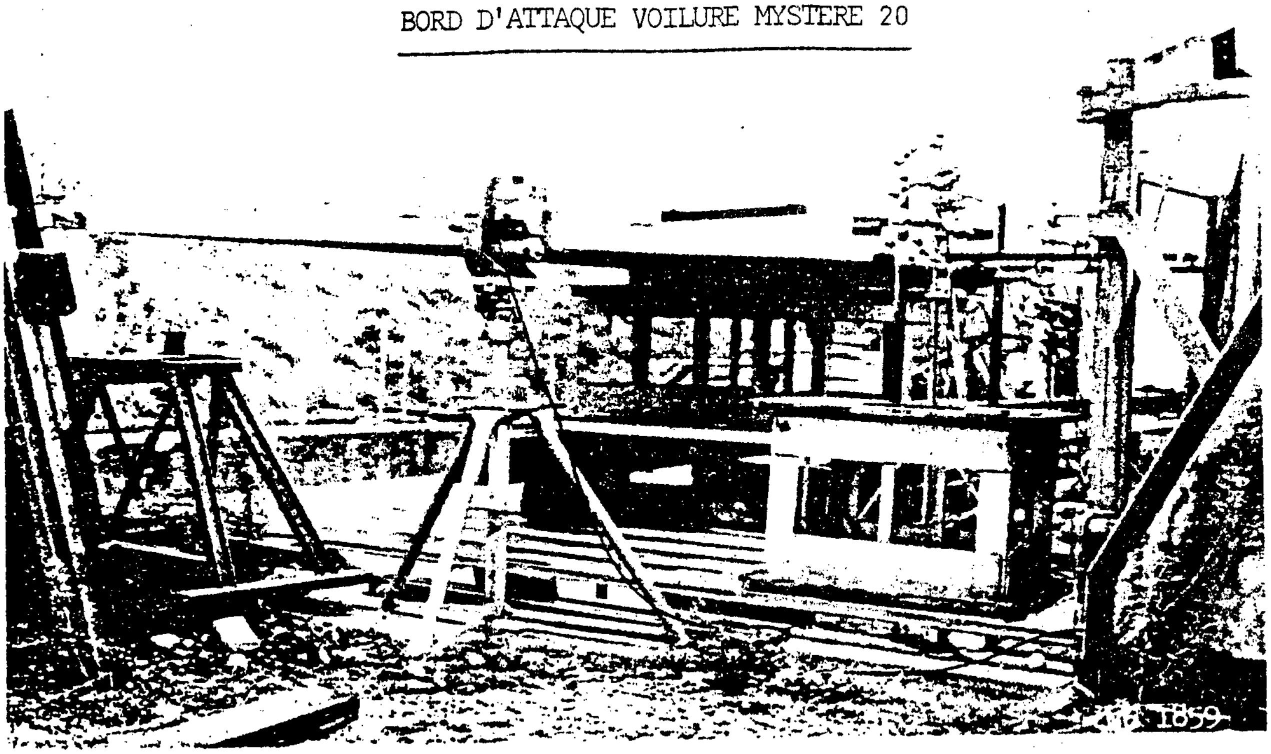
BORDS D'ATTAQUE
FALCON 10 ET MYSTERE 20

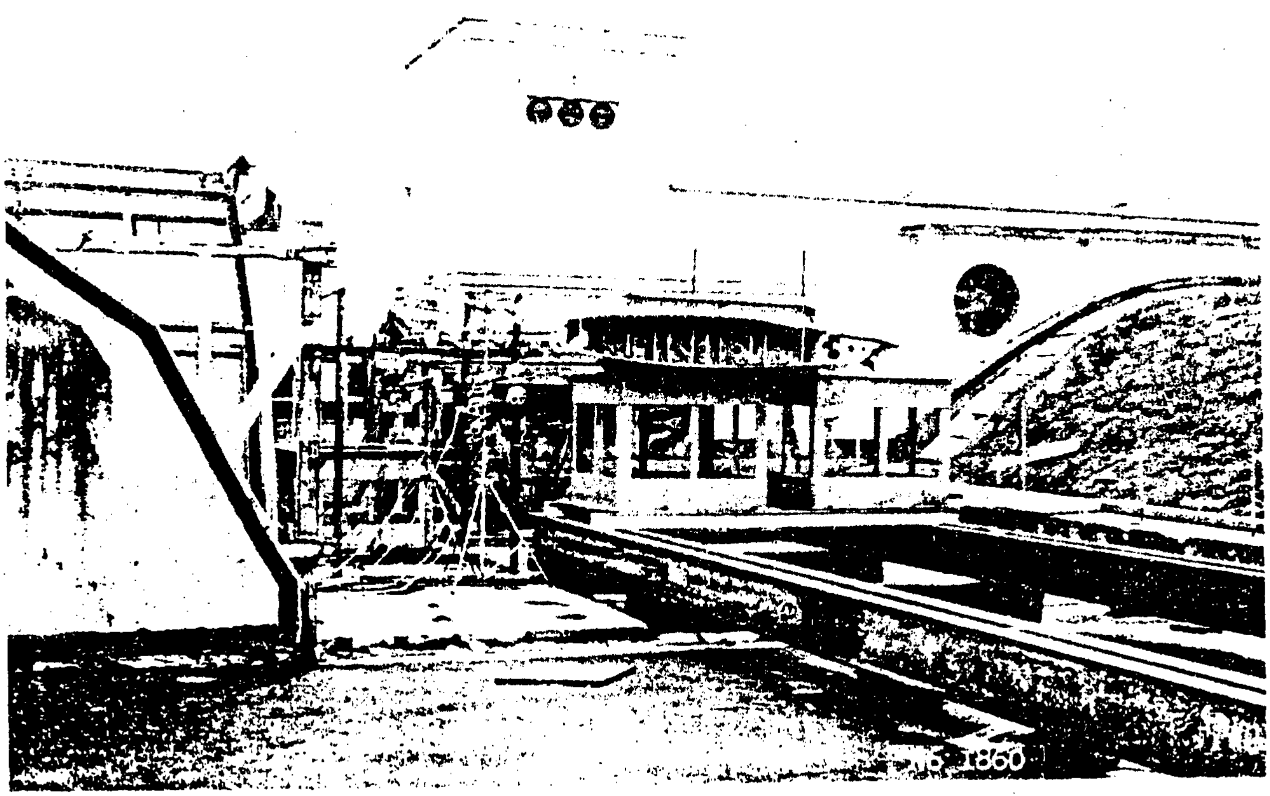


BORDS D'ATTAQUE C.E.A.T.



BORD D'ATTAQUE VOILURE MYSTERE 20



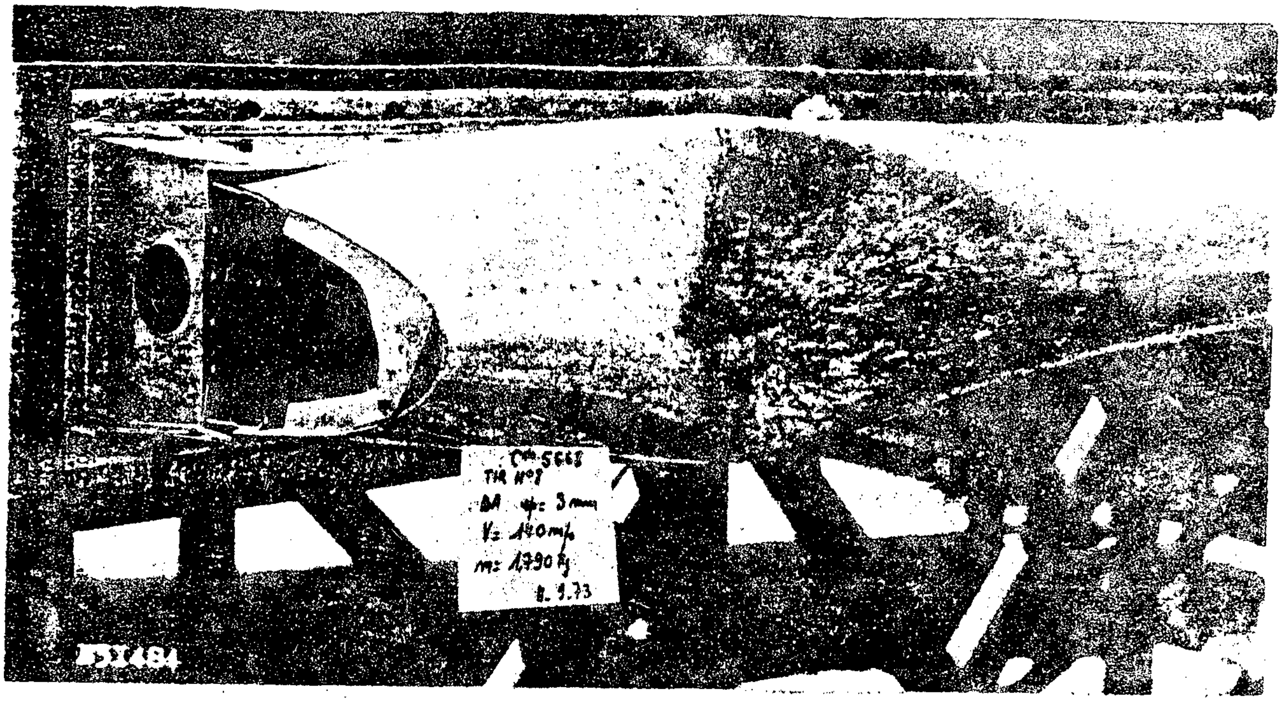


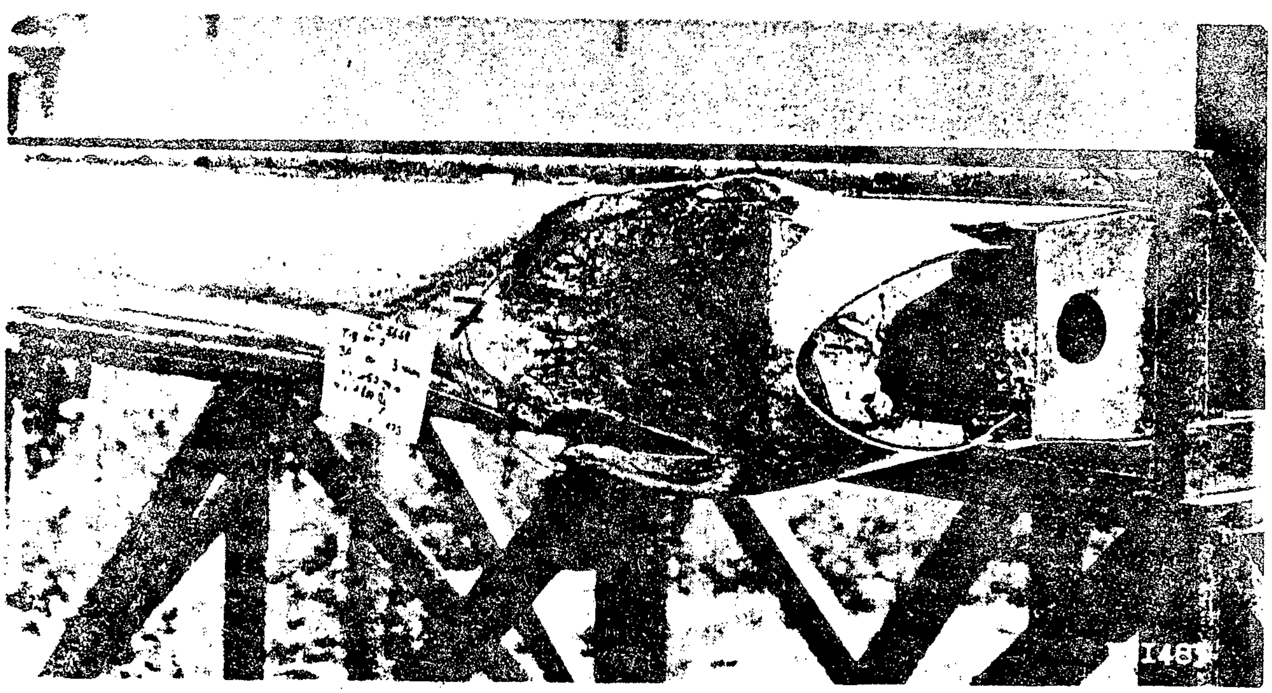
Montage d'essai

PLANCHE N° 11

DTM-6103/78 Planche 12

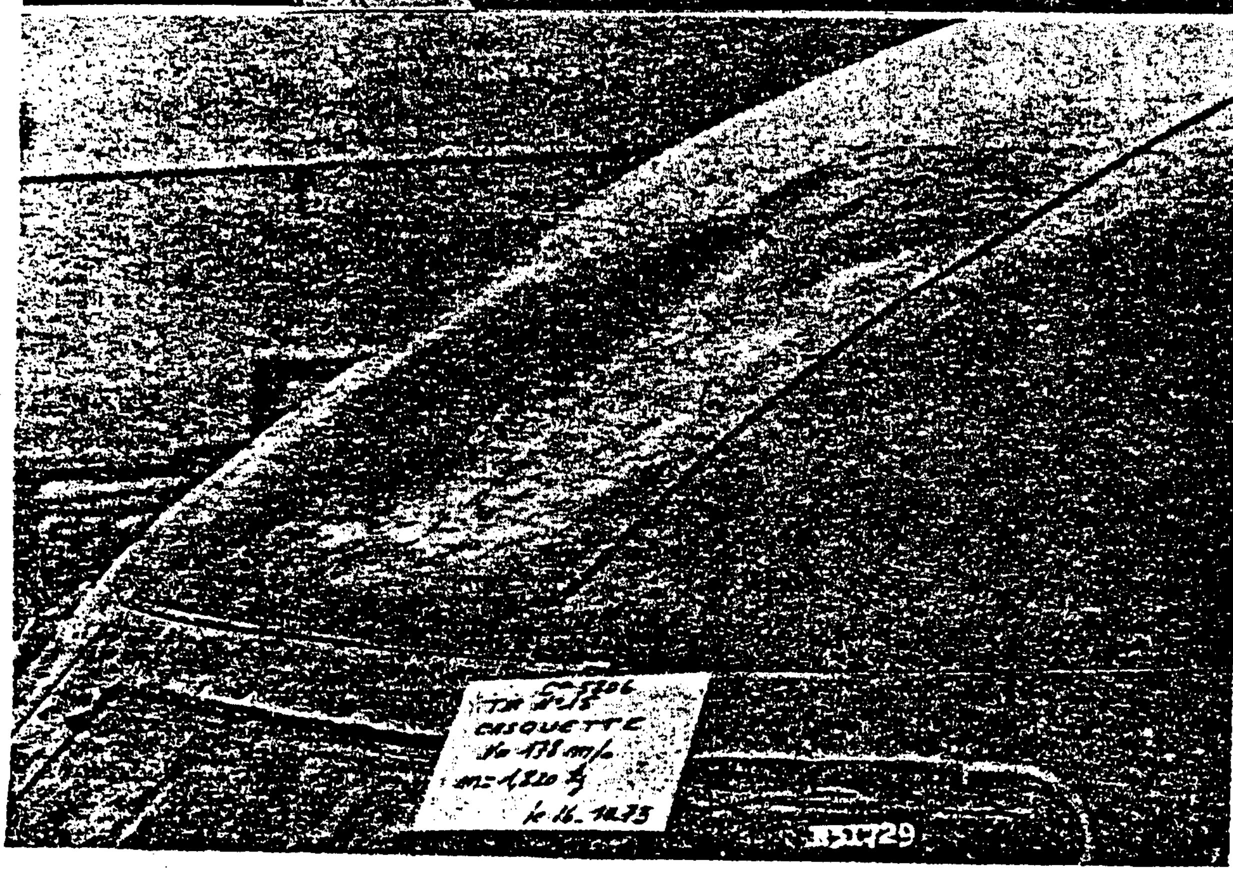
BORDS D'ATTAQUE C E A T





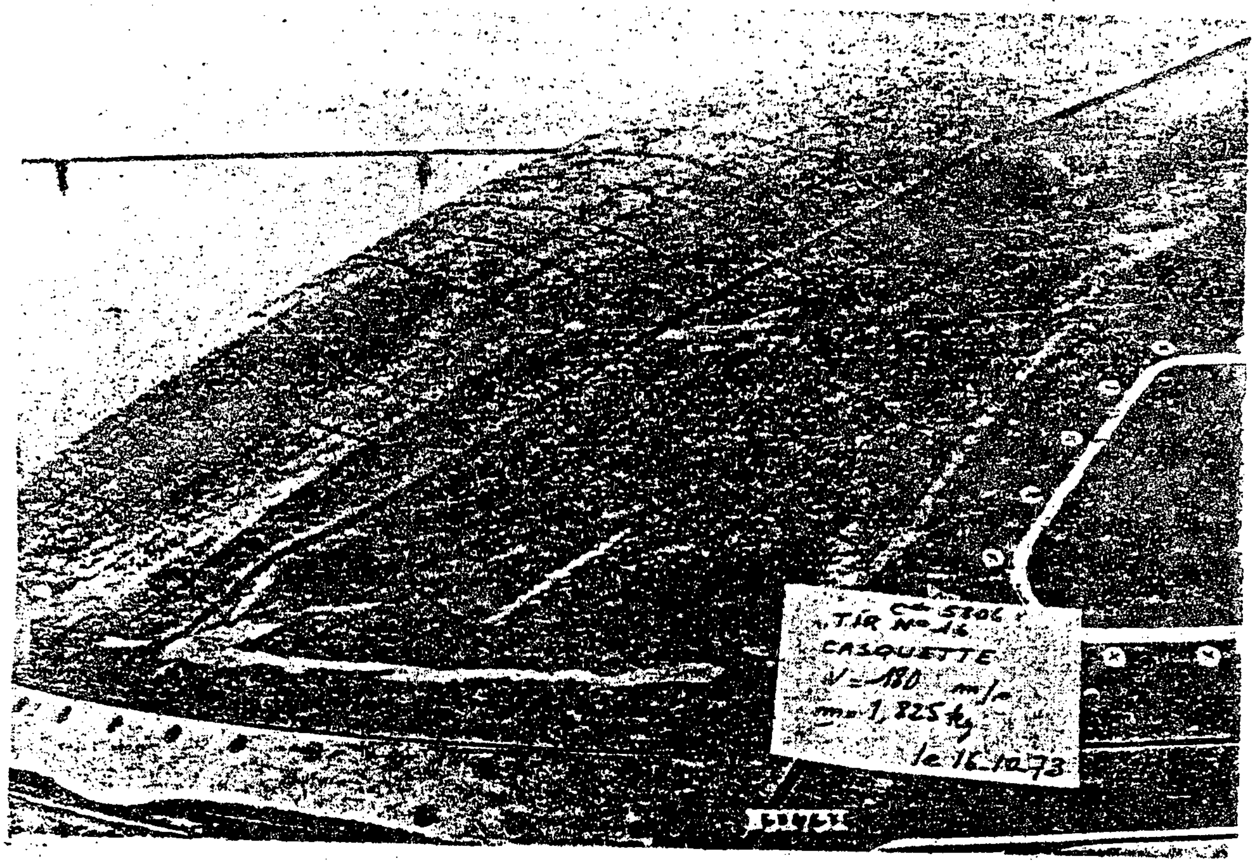
313

CASQUETTE MERCURE



321

CASQUETTE MERCURE



WORKING PAPER ON THE OPERATIONAL USE OF BIRD STRIKE INFORMATION
FROM A PILOT'S VIEW

It may come as a surprise to some that in fifteen years of active civilian flying in Europe I never came across a so-called "birdtam". Needless to say that after attending this meeting I will certainly be on the lookout for my first birdtam. However, after reading WP 34 and especially the Appendix, I wonder if I will be able to recognize it as such.

As you know, we civilian pilots, have to constantly interpret and digest a mass of information which is necessary to prepare and execute a flight. This material is mostly in connection with meteorological and technical factors which can directly affect the safe conduct of the flight. The quick assimilation of this information is only possible through the extensive use of abbreviations in such publications as NOTAM's - SNOWTAM's and SIGMET's, all of which have to be analysed before flight. To all this we are now adding a BIRDTAM, the necessity of which is of course recognized by the pilots. However we find it imperative that the presentation of the BIRDTAM be short, concise, standardized and, above all, in clear language.

The first part of this paper dealt with the pre-flight stage; now we will look at the aspect of bird avoidance with respect to the flight itself. We consider the take-off and initial climb up to 1500 feet to be the most critical phase with regards to bird strike. This is in fact the phase of flight where a bird collision could lead to the most severe consequences. During this stage there is practically no possibility for avoiding action except during taxi and up to V_1.

The next most critical phase is considered to be the approach, a part of the flight where the pilot is committed to accurate and restrictive procedures. This leaves him with very little room for variation in speed, configuration and bird collision avoidance. The earlier a pilot is warned during his approach of bird hazards, the better he

will be able to cope with the situation. Below 1000 feet/ground the only possible avoiding action could be the initiation of a go-around.

In our opinion the bulk of the effort should be directed towards the development of better bird scaring methods as they are judged to be the most effective means of minimizing bird strike hazards during the two most critical flight phases.

CAPT. JACQUES SANCHE

IFALPA

Discussion on WP 38

Richards: I suppose that your results are valid mainly for the engines?

Sanches: We have not had time to make a study of that.

Thorpe: It will be necessary to concentrate even more on bird scaring equipment.

Sanches: All those actions should already be done e.g. removals of garbage dumps from the vicinity of airports.

SECTION 7

Terms of Reference

7.1 Terms of Reference of the BSCE (Reproduced from Working Paper No. 1)

7.2 Terms of Reference of the Editing Committee (Working Paper No. 1)

7.3 Terms of Reference of Vice Chairman

TERMS OF REFERENCE OF THE BSCE

The Bird Strike Committee Europe shall :

a) collect, analyse and circulate to all concerned data and information related to the bird strike problem in the European Region ;

Note : This data and information should include the following :

1. Civil and or military data collections and results of analyses on bird strikes to aircraft.
2. Results of any studies or examinations undertaken by states in the various fields related to the bird problem.
3. Any information available in the field of design and structural testing of airframes related to their resistance to birdstrikes.
4. Any other information having a bearing on the bird strike question and the adding to the solution of the various problems involved.

b) study and develop methods to control the presence of birds on and near aerodromes;

c) investigate electro-magnetic wave sensing methods (e.g. : radar, invisible light, etc) for observing bird movements ;

d) develop procedures for the timely warning of pilots concerned where the existance of a bird hazard has positively been established ;

e) develop procedures, if appropriate, for the initiation by air traffic control of avoiding action where the existance of a bird hazard has positively been established ;

f) develop procedures enabling a quick and reliable exchange of messages regarding bird hazard warnings ;

g) develop any material (e.g. : maps, back-ground information, etc) intended for inclusion in Aeronautical Information Publications;

h) aim at a uniform application, throughout the European Region, of the methods and procedures and the use of material developed in accordance with b) to g) above, provided suitable trials have proved their feasibility, and monitor developments in this respect .

TERMS OF REFERENCE OF THE EDITING COMMITTEE, BSCE (revised)

1. An Editing Committee is appointed as a policy steering committee to assist the Chairman of the BSCE between and during Meetings. The main tasks of the Editing Committee are :

   a) study, evaluate and select papers to be presented to the Working Group and the Plenary Meeting,

   b) during each BSCE Meeting participate in preparing recommendations, proposals for text for inclusion in the Report, and, where necessary, any other papers of a general nature.

   c) at the end of each BSCE Meeting participate in preparing the Report of the meeting and prepare the follow-up action of recommendations.

   d) assist the BSCE Chairman in formulating BSCE Policy Statements.

2. The Editing Committee should consist of :

   (i) The BSCE Chairman and Vice Chairman

   (ii) The previous BSCE Chairman, if possible

   (iii) The Chairman of each BSCE Working Group

   (iv) The observer from ICAO

   (v) A representative of the host State.

3. The BSCE Chairman acts also as the chairman of this committee and is entitled to call meetings of the Editing Committee as and when required during BSCE Meetings.

4. The conclusions of the Editing Committee should be presented to the Plenary Meeting of the BSCE for action. Alternatively the members of the BSCE should be kept informed of the activity of the Editing Committee between full meetings of the BSCE.

TERMS OF REFERENCE OF VICE CHAIRMAN

RESPONSIBILITIES OF THE VICE CHAIRMAN

1. To assist the Chairman to carry out the work of BSCE.

2. To take over the responsibilities of the Chairman in the event of the Chairman being unable to carry them out.

3. To represent BSCE when so designated by the Chairman.

TERMS OF OFFICE

4. Vice Chairman is elected by the Committee for a 2 year period at a different time from the Chairman. More than two successive periods of Vice Chairmanship is not normally allowed.

BSCE 13 - 8
1 September 1978

SECTION 8

REPORT OF THE MEETING by the Chairman of BSCE,
M. V.E. Ferry, France

Introduction

Part 1 - Chairmans's Report

Part 2 - Report on the 13th BSCE session

Part 3 - Conclusions resulting from Section 8 of the 13 th Meeting Report

4-3

REPORT ON THE THIRTEENTH MEETING OF THE BSCE (BERN 29 MAY TO 2 JUNE 1978)

1. INTRODUCTION

1.1 This report is composed of the following three parts:

a) The chairman's Report (Part 1)

b) The report on the work done inside Working Groups of BSCE (Part 2)

c) The conclusions resulting from b) (Part 3)

1.2 The Chairman's Report, mentioned under a) above, contains a brief description of the proceedings of the Meeting, the organisational and administrative arrangements for the conduct of the Committee's business and for its future work.

1.3 The report on the work done inside working groups mentioned under b) above supplements and/or supersedes the previous reports on this subject. It consists of a summary of the points made during the discussion in BSCE WG's on the subjects considered during the 13th Meeting and as such it serves to support the conclusions reached and the Recommendations which have been agreed by that Meeting.

1.4 The conclusions resulting from this Report, as contained in its Part 3 were reviewed by the Committee during its 13th session, and amended slightly for editorial purposes. As a consequense of this, Part 3 is in fact superseding the draft circulated during the meeting, included in this report for information only (Section 1 of the Report refers).

PART 1

CHAIRMAN'S REPORT

1. GENERAL

1.1 The 13th Meeting of the BSCE and its Working Groups was held from May 29 to June 2 1978 in BERN (GPO building). A list of participants with addresses is attached in Section 2, of the Report.

1.2 At the opening session, the meeting accepted the following agenda:

Item 1: Presentation of papers

2: Report of the work done by each Working Group

3: Review of the existing terms of reference of BSCE

4: Review of the existing terms of reference of the Editing Committee

5: Review of the existing terms of reference of BSCE WG's

6: Review of the need for a Vice Chairman for each W.G

7: Election of W.G's Chairmen and Vice Chairmen where appropriate

8: Report from the Chairman

9: Election of BSCE Chairman and Vice Chairman

10: Establishment of a new Working Group

11: Future work

12: Next meeting

13: Any other business

1.3 The meeting was chaired by Mr Ferry reelected for a one year period at the end of 12th meeting. (See 2.4.3 part 2 of the report 12th meeting).

The vice-chairman (L-O Turesson) assisted the Chairman and took over when it was felt necessary.

1.4 Mr U Schneiter of the Office Federal de l'Air acted as Secretary and was in charge of the administration, typing, printing and social events.

40

2. COMMITTEE ARRANGEMENT

2.1 The Committee, at the end of the 11th meeting found it necessary to elect a Vice Chairman (see Section 8 Part 2, Para 2.4 of the report of 11th meeting) for a two years period ending with the 13th meeting.

2.2 The Chairman ending his term at the 13th meeting did not candidate for a further period and election of a new chairman had therefore to be done.

2.3 The Vice Chairman also ended his term and election of a new vice chairman was planned.

2.4 Each working group stays with the already agreed organization.

3. PROCEEDINGS AT THE MEETING

3.1 Discussions on the objects considered by the Committee in accordance with the Agenda are reported in Section 8, Part 2, and the recommendations formulated as a result of these discussions are contained in Part 3.

4. WORK PROGRAMME UNTIL THE NEXT MEETING

4.1 At the end of this meeting, the Committee agreed on the following work programme until the next meeting:

4.1.1 Work to be done inside Working Groups

Complement to the list published in BSCE 12 - part 1 when appropriate.

1) Work to be done inside Bird Movement Working Group:

i) revise existing maps, namely

- bird hazard maps for general information
- AIP maps for more detailed information

on the basis of available knowledge and investigation results.

ii) if necessary organise meetings of the Working Group like the meeting of November 1977 held in Germany.

2) Work to be done inside Communications and Flight Procedures Working Group

i) review the existing ways to forward information according to the validity and type of contents. Prepare a questionnaire, circulate it and assemble all procedures already in use in a booklet

ii) if possible try to standardise some of the procedures refered to in i)

iii) investigate the use of ATIS system and report for the next committee meeting

iv) prepare a compilation of the procedures already in experimental use in different countries to reduce as far as possible bird hazards in relation to flight potential

v) if possible start experiments on the feasibility of such procedures

3) Work to be done inside Aerodrome Working Group

i) ensure that all information collected by the Group about homing pigeons in the vicinity of airports is reflecting the real situation as regards breeding or racing pigeons

ii) collect the results of experiments carried out in various countries about the application of chemical agents as bird repellents and evaluate their operational use

iii) collect information on the economical and operational aspects of the bird strike prevention measures

iv) prepare a booklet describing the measures available to the airport managment for the reduction of bird hazards at airports

4) Work to be done inside Analysis Working Group

i) prepare a multi-language table of birdnames and their mean weights

ii) modify the format and contents of statistics of military and civil aircraft bird strikes according to the decision taken by the group at the 13th meeting BSCE

iii) circulate a firm proposal on a joint participation in a computer data base for bird strikes recorded in Europe and develop a code

5) Work to be done inside Radar Working Group

i) investigate the use of SODAR (Sound Detecting and Ranging) or accoustical sounding equipment in bird detection in the atmosphere and prepare a short report

ii) examine further the use of image-intensification equipment for bird detection at night near and on airfield and prepare a detailed report

iii) examine the use of infrared viewing equipment for bird detection at night

iv) prepare a questionnaire on standardization in obtaining height information

6) Work to be done inside <u>Structural Testing of Airframes Working Group</u>

   i) compile from information at hand a manual giving "Design guidance" derived from bird impact structural testing results.

4.1.2 <u>Other Activities</u>

1) to continue studies aimed at the use of a warning network (combination of radar or visual observation on the spot, NOTAM code, communication system, interpreting centre, phraseology to be used by controllers, special maps inserted in AIP) for aircraft in the vicinity of aerodromes.

2) to continue studies aimed at a uniform method of displaying permanent information in order to obtain a uniform coverage of Europe and its immediate vicinity.

3) to develop a common basic policy with other organisations in order to standardise BSCE methods (or improved methods) aiming at reducing the bird hazard whenever possible.

4) to continue studies on the actual cost of bird strikes and the cost effectiveness of the use of the aforesaid methods.

5) to establish and maintain close connection with Pilot's and Airport's Associations in order to improve the efficiency of the information of the bird avoidance procedures.

4.2 <u>Work on the above subjects was assigned as follows:</u>

a) if not differently stated in the following, work on subjects listed on 4.1 from 1) to 6) is assigned to each WG's chairman.

b) the Chairman of the BSCE will take part in work assigned in para 4.1.1 under 2) v) 3) iii) 4) iii) 5) iv), the work being undertaken primarily by the WG's chairmen (recommendations BSCE/10, D5, BSCE 11, Section 1, BSCE 12 and 13 Section 1 refers).

5. ARRANGEMENTS FOR THE NEXT MEETING

5.1 The Committee did not develop a specific Agenda for its next meeting because this depends to a considerable degree, on the progress achieved by each working group on the work programme outlined in para 4 above.

5.2 It was however agreed, that for the time being, the following points retained for possible consideration at the end of 11th meeting and reintroduced at the end of 12th meeting should be explored.

a) tentative list for future meetings (periodicity, host country)

b) preparation of a generally acceptable document regarding

   i) a booklet for airport managers to provide assessed solutions when a problem dealing with bird activity appears on an aerodrome.

   ii) the evaluation of the bird risk in large areas in terms of biomass.

   iii) the ability of a certain aircraft, parts of aircraft, and engines to withstand birdstrikes.

   iv) guidance on Structural Testing of Airframes for eventual inclusion in the ICAO Airworthiness Technical Manual.

c) future organisation of BSCE (possibility of a permanent secretariat and composition of delegations).

d) submission of reports for future BSCE meetings.

e) election of BSCE Chairman and vice-chairman

5.3 The Committee discussed drafts proposed by the various Working Groups and urged to be presented drafts of firm proposals on the subjects listed in 5.2 b) so that at its next meeting, the Committee would be able to make firm recommendations.

5.4 Regarding the subject of Working Group tasks it is accepted that

i) the report presented by the Working Group's Chairmen to the Committee will have three sections:

   1) review of the work already completed according to the previous recommendations from the Working Group.

   2) progress report of the work done during the previous year

   3) chairman's report on discussions, with a short review of WP presented and conclusions reached by the group with propositions of recommendations. (See also note below.)

ii) the Report will be available and circulated before the opening of the plenary session of each BSCE meeting.

5.5 As to the date and place of the next meeting of the Committee, it was noted that this problem has risen concern at each meeting and that an acceptable solution should be found.

a) Periodicity

   1) the attendance is growing at a steady rate. More countries are now participating in BSCE activities and because WG's are expanding they are attracting larger groups of specialists. It was noticed that the annual meetings are now grouping around 100 people, distributed in six working group meetings, some of them simultaneously, so the organisation of such meetings has become a difficult problem.

Note to para 5.4 i) 3): Working Group meeting notes would be included in the main report from the Meeting.

2) the number of Working papers presented is almost constant or slightly increasing and rather seldom covering new fields of research.

3) these two facts has lead to a proposition (WP 22) that the period between two consecutive meetings should be enlarged. After discussion and vote the committee agreed to have meetings every 18 months.

4) meeting place

As already recorded during BSCE 12, three countries are on the list for possible hosts. Netherlands and Belgium have already started arrangements, Denmark is ready if necessity arises.

After discussion it was agreed tentatevely that the next meeting be held in Netherlands in 18 months, followed by Belgium in 36 months and Germany in 54 months from this meeting.

5.6 Following a recommendation agreed during ICAO Asia/PAC Regional Air Navigation meeting (Honolulu 1973) and approved by Air Navigation Commission, the Secretary General of ICAO organized a workshop on bird hazards in Bangkok from 20 to 23 of March 1978. BSCE was invited to provide lectures and informe participants (from 15 different countries) about experience gained in Europe.

A summary of lectures and discussions was presented (WP 9) by the Vice Chairman. Should this meeting be judged successful by ICAO, similar sessions will be planned in other ICAO Regions with the participation of BSCE.

5.7 A BSCE "Code of Practice" is well under way at the request of ECAC (European Civil Aviation Conference). Some chairmen of working groups have given contribution concerning their respective sections of the work.

5.8 It was noted that the work inside working groups could be enhanced and the follow up of recommendations speeded if national representatives be nominated by each country. The discussion showed that this situation could only be met if a National Committee exists. So National Committees shall be requested by the Chairman to provide BSCE in due time with details of the participants and in what working group national experts will participate (if possible as participating nation's representative).

5.9 Participants were informed that the report of the Third World Conference, supplementing BSCE 12th meeting report, was made available by ICAO for the benefit of all Contracting states (Ref E 4/163 - 78/40 from 17 March 1978).

The report on the workshop on reducing bird hazards held in Bangkok (20-23 March 1978) was circulated by ICAO Far East and Pacific Office to participating countries (note that this report has no official status and is not subject to any formal action by ICAO).

6. PRESS COVERAGE

A rather comprehensive account of the work of BSCE and of its 13th Conference was given in the "Tages Anzeiger", Zürich. The article contained information about the activities of the six working groups specially mentioning the proposed radar watch with a chain of stations along the Alps. Different measures for scaring birds from airports were mentioned and also the importance of exonomical losses giving examples from Swissair.

PART 2

REPORT ON THE BSCE 13TH ANNUAL SESSION

1. INTRODUCTION

1.1 The 13th report on the BSCE annual session relates to the work done inside Working Groups, which assembled at the same time, and by the Committee as a whole when dealing with its specific tasks.

1.2 As all papers presented during the session appear in Section 6 of the Report, this part will cover the following subjects:

a) analysis of work done by each Working Group

b) review of the administrative problems

c) review of actions to be performed following the recommendations

d) special problems

2. DISCUSSIONS OF SUBJECTS TO THE BSCE

2.1 Before entering into the discussion of specific items mentioned under para 1.2 above, the Chairman felt that the tasks given to him each year, if properly dealt with, do not leave enough time to think about the future of the BSCE and act as a representative of the BSCE to International Organisations. This last work, deemed urgent, calls for frequent interviews in different located headquarters. The Editing Committee is now firmly established and provided guidance during the session. The routine was assured by the Vice Chairman. The team so constituted worked closely and efficiently.

The problems raised during the 12th Meeting have not been solved as the key of a better administrative structure and of the location of the next meeting seems to be closely connected with funds availability.

However a promising step is now under way with a joint programme on computer analysis of bird strikes recorded by European countries. This could lead to a more rigid structure of BSCE and partly solve the administrative problems already identified.

Although these matters have not direct influence on the work carried out during the session, it has been noted that they should be recorded in a proper way and be part of the Report. They appear under item b) under para 1.2 above.

2.2 Even though the Committee recognized that some shortcomings existed in its way to solve problems, it has been felt unnecessary to enter into too abrupt changes without having time to test the validity and the efficiency of the modifications. It was expected that, if still necessary, members would raise this matter again at the next suitable opportunity.

2.3 As regards representation of the BSCE to International organisations a new step forward was made at the plenary session. The former Chairman agreed to act as a liaison officer to other organisations if the meeting so wished, was confirmed in this role and received full credential to perform his new task.

2.4 Reports on working groups, and special features related to them

2.4.1 These appear under Section 5 of the main Report and reflect the nature and specific tasks of each Group.

The following changes have been proposed and someof them introduced in the terms of reference of some working groups in order to allow them to face new situations

a) W.G. Analysis

"collection, analysis and circulation of statistical information relating to bird strikes"

b) Structural Testing of Airframe

a proposal to add the word Engines to the title of the group was turned down for the reason that experts attending are mainly airframe engineers with only a limited information on engines. W.G. Chairman was invited to investigate if the Vice Chairman (to be elected) could not be an engine specialist.

2.5 Administrative problems

2.5.1 The Committee has revised its Terms of Reference and those of the Editing Committee. Another problem arises with the election of a liaison officer. The Committee decided according to the following:

1. No changes shall be introduced in the Terms of Reference of the Committee.

2. The Terms of Reference of the Editing Committee, para 2 item i) shall be changed and read:

   i) the BSCE Chairman and Vice Chairman

3. To prepare a letter giving credentials to the liaison officer to act on behalf of BSCE during cooperation with international or Regional organisations.

4. Because of the election of the Vice Chairman to the chairmanship for 2 consecutive meetings, the position of vice chairman has to stay vacant. A call for a candidate will be made before next meeting.

The Terms of Reference appear in section 7 of the main report and the work program in section 8 Part 1 para 4.

2.5.2 Attention has been called to the number of Working Papers, which as noted earlier, are steadily increasing in number and complexity. The chairman was asked at the 11th meeting to prepare a summary of

all Working Papers published from the 1st annual session to the present day with a classification following the Working Groups' Terms of Reference. The summary will be published as a BSCE circular and will provide a basis for the Editing Committee to select Working Papers.

However the task could not be fulfilled for the 13th meeting but the former Chairman will try to complete the work before the end of 1978.

2.5.3 It was felt that the content of some working papers was too specific for a lecture during the plenary session, so these papers were by the Editing Committee transfered to respective Working Groups. The summary of these papers and related discussions now appear in W.G. reports (see section 5).

2.5.4 The problem of a permanent Secretariat, proposed during the 10th session of the BSCE, has not progressed.

Inplications have been discussed in section 2.1 above.

2.5.5 According to normal practice the chairman of BSCE is elected for a period of two years, which could be renewed. After a discussion at the end of the 12th meeting the acting chairman agreed to be reelected for one year, leaving the question open if a change of philosophy has to be envisaged.

This change seems to be urgent now, as the periodicity between two meetings is 18 months instead of one year and as there was no candidate for vice chairmanship.

2.5.6 Supplementing normal reports special information papers have been circulated calling the attention of members on activities of other international organizations regarding the reduction of birds hazards.

1. The work programme of ICAO for the 88th session of Air Navigation Commission (ANC) includes two items: "Bird strikes to aircraft" and "Bird hazard reduction". Members were invited to provide proper documentation to their State representatives in order to allow ANC to be fully aware of the BSCE work and obtain information from them on the task already dealt with by ANC.

2. EEC has prepared a Directive on bird conservation which needs to be improved in order to allow the use of methods developped to reduce bird hazards on and in the vicinity of airports.

3. ECAC has expressed the view that they would provide help in the adoption by Contracting States of methods developped by BSCE.

2.6 Action to be taken:

2.6.1 The liaison officer was specially charged to visit all relevant authorities at a convenient level, to obtain better liaison and understanding. Experience acquired last year has confirmed that minor problems can easily be solved in so doing.

2.6.2 According to this policy the Committee agreed that BSCE provides experts everytime needed in order to help ICAO organize workshops on reducing bird hazards.

2.6.3 It was proposed to establish a working group dealing with problems encountered by airlines due to bird hazards and acting as a technical adviser. This question should be discussed during the next meeting if a working paper suggesting work programme and terms of reference is prepared.

2.6.4 Recommendations emerging from the Working Groups are included in Section 1 of the main Report.

PART 3

CONCLUSIONS RESULTING FROM SECTION 8 OF THE 13TH MEETING REPORT

1. As a routine, BSCE meetings end with the adoption of recommendations. Only those of general nature are shown below because some are addressed to the Chairman as assigned tasks on behalf of the Committee and reflect the conclusions of the meeting:

Section 1, Recommendation

A 1 and 2	Bird maps (to be delt mainly with ICAO)
B 1 and 2	Collection and circulation of birdstrike data
C 1	Joint studies of bird concentrations
D 1	Designation from each country of an expert responsible for reporting to Structural testing working group about progress in this field of work
D 2	Deterioration of windscreen strength
E 1	Chemical repellents
E 2	Brochure summarizing procedures
F 2	Use of ATIS

2. The time lapse as usual being too short to allow a general consultation on the presentation of this Report and the redrafting of recommendations issued by Working Groups and approved by the Committee the only conclusion formulated by the chairman is:

Conclusion 1: As International Publications (see ICAO Doc 9137-AN1898 edition 1975 Airports Service Manual, Part 3) and BSCE code of parctice are available and agreed, all States are requested to ensure that methods used on airports are in full accordance with the above documents.

As it was noted this recommendation emerged from the 11th meeting and is still valid.

Note: ICAO will issue shortly a revised edition of Airport Service Manual, part 3.

Section 9 - Speech of gratitude to the honour of the resigning chairman

BSCE 13 - 9

30 July 1978

Speech of gratitude to the honour of the resigning chairman, Vital E Ferry.

by L-O Turesson, Swedish Board of Civil Aviation

Dear Vital,

You belong to the tiny group of founders of Bird Strike Committee Europe who started up the work 12 years ago. All that time you have been a very active member of the Committee, especially when it comes to communication of information and messages. You are also in other aspects a man of communication, travelling as you are most part of your time.

Your very movable life has not hindered you from taking up the position as chairman of BSCE and go on with this task for as long period as 4 years. This despite the fact that we are a very miscellaneous group of people: ornithologists, engineers, people from civil and military aviation, from agricultural and environmental authorities, pilots and air traffic controllers, flight insurance people, not to speak about those meteorologists!

You have indeed carried out your task with brilliancy, trying to improve the work in all different sections, giving advise and also putting your finger on points where the activity has been lacking. Perhaps your most important contribution has been the improvement of the co-operation with other international organizations, above all with ICAO. - Mainly with your help we have now reached a position where ICAO really takes our work with the birdproblems of aviation into full consideration.

I met you for the first time at the meeting in Copenhagen, seven years ago. The second half part of the period after that, or from the autumn of 1974 in connection with the planning of the Stockholm conference, we have been in close contact with each others through many meetings and much correspondance. For some periods the letters between us have gone as often as the postal service has been able to carry them. - The co-operation between us has been, I dare say, very good and the friendship has grown stronger and stronger. I thank you for that!

The deep gratitude of the whole Bird Strike Committee Europe goes also to you now, Vital, when you are leaving the chairmanship after a very well fulfilled duty. We thank you so much for a well completed work, for an excellent leadership in your special, many times so humorous way and for a good friendship. We are also happy for the fact that you will not leave BSCE but stay in your position as chairman for working group Communications and continue to help us in the co-operation with ICAO and other international organizations in your new capacity as our liaison officer.

As a symbol for our gratitude I would hereby like to present to you an engraved goblet from the members of BSCE and a card with our names.

Thank you so much!

4/8